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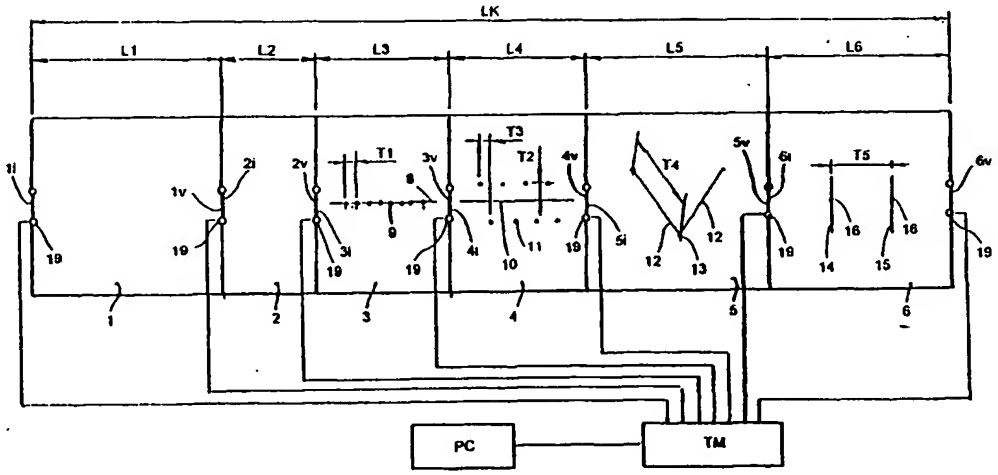
(54) Title: ARRANGEMENT AND PROCEDURE FOR TESTING AND IMPROVING THE PHYSICAL CONDITION AND TECHNICAL SKILL OF SPORTSMEN



(57) Abstract: The invention relates to arrangements and methods for testing and improving the physical condition and the technical skills of an athlete, especially a football player. The test athlete carries out independent or combined exercises selected out of sprint, jump and slalom runs on play-grounds with marked trajectories, and/or training appliances like goals, ball rebouncing walls or obstacles allowing the simulation of different tests situations. The individual performance can be evaluated based on electronically acquired data based on measurements made with electric or acoustic sensors.

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ARRANGEMENT AND PROCEDURE FOR TESTING AND IMPROVING THE PHYSICAL CONDITION AND TECHNICAL SKILL OF SPORTSMEN

The invention relates to arrangement and procedure for testing the characteristics of the physical condition of human body, and comprises at least two field sections established on a flat area. Though the arrangement and procedure have been developed mainly for testing sportsmen, in the first line football players, they are suitable for testing anybody.

The invention relates also to arrangements for testing the technical skill of football players, to the development of which plane reflective elements, and/or goal, and/or suspended elements, and/or electric passing-through sensor are applied, and the invention relates also to the procedure suitable for testing the technical skills of football players, which can preferably be performed by the use of the arrangement according to the invention.

Further on, the invention relates to an arrangement comprising one or more training grounds simulating different technical situations for improving the technical skill of football players. On each training ground, at least one goal, and/or one hanging obstacle, and/or electric passing-through sensor, and/or wobbling obstacle, and/or reflective element and/or reflective element provided with a mechanism deviating the element from the vertical direction, and/or with a mechanism adjusting the height of the reflective element are placed.

Finally, the invention relates also to tools applicable in these or other arrangements used in training grounds.

It is known that football playing has been in a professional crisis situation worldwide, the professional level of matches has rapidly fallen in recent decades. The reason for this should be sought first of all in the lack or dispropor-

tion of the education of players. The performance of football players in the match (and generally, the efficiency of every sportsman in contest) depends on his/her condition and technical skill, as well as on his/her psychical state. Trainers, by using the easier way of grounding, developed the physical performance (achievements) of players to an unbelievable extent, whereas their technical education was pushed into the background. The result is the striking increase in the intensity of matches, growing struggle, aggressive man-against-man fight, in time and place restricted possibilities for action. Since during the training of players the technique was not adjusted to this increased pace, the conclusion is naturally: technical virtuosity disappeared from training grounds (football fields). Thus, this new situation requires excellent physical condition, higher and more complex technical grounding (preparedness). For developing these virtues, new methods became necessary.

For expedient and efficient development, appropriate testing is indispensable. This should be extended to both, physical preparation and technical grounding. The judgement of these, as usually judging of all parameters, is reliable only, if it is done in an objective manner. However, not only for football players, but also for all sportsmen, and even for anybody, such an objective judgement could be needed e.g. to test the extent of loadability, the regeneration and physical state of somebody recovering from an illness or injury. Objectivity can only be guaranteed by using suitable testing methods and appropriate instruments (measuring, testing, etc. instruments).

Judging of thorough grounding is possible in physiological, motoric and psychological sense. Physiological (medical) evaluations occur by the application of usual medical instruments or by laboratory load tests. Such instrument suitable for laboratory examinations is shown in the US patent No. US- 3.675.640,

in which the person to be examined by a load-test (e.g. with a walker, bicycle ergometer, manual ergometer) is exposed to a load by movement (kinetic load), then data are taken concerning the pulse number, heart rhythm, blood pressure, EKG, O_2 uptake, CO_2 expiration, respiration volume and rhythm, which are then brought into correlation with the status of the person examined. By the help of these data, a complex curve expressing the real performance can be taken up, which is suitable for evaluating the dynamic health state (DHE - dynamic health evaluation), as well as for determining the dynamic state change during the measurement, together with its rate. Simpler, or according to a given aspect more refined versions of this method are also developed, such as the ergometer driven manually or by foot described in US- 3.744.480, or the walk-band ergometer in EP-0.394.146 for study the extent of loadability, and the heart-lung examination system given in US-4.463.764 or the system in EP-0.176.277 for taking up actual respiration data under load, the blood pressure monitor described in US-4.617.937 provides blood pressure data under load and takes up ECG curve, whereas for examinations under real circumstances, a recorder registering ECG signals and the speed of the bicycle can be used for cyclists on their way according to the US-4.434.801 patent. In US patent no. US-4.658.832, a broadcasting system is described which can be applied on running athletes and which records the respiratory characteristics. These can be then passed to the evaluation center beside the training ground. These studies, corresponding to their original aim, can provide answers only to questions about general physiological fitness, but they cannot give a picture on the physical state necessary to be engaged in a certain kind of sports.

Physiological examinations are thus complemented with different methods testing the motoric performance.

To the above category belongs a method shown in patent US-4.343.315, in which the person to be examined should walk along four sections of a training ground, preferably along concentric circles of increasing path lengths, each of the four sections to be performed during equal times (under increasing load) under control of a two-channel electrocardiograph recording the heart function. If we take into account that in the example only 12 seconds are given for walking one circle, and the circumferences of the circles are 16-24 m, we can feel the urge that, besides time-consuming laboratory load tests, equivalent, fast examinations are also desired. This solution takes us already to the region of testing the motoric performance.

The simplest and best known method for testing motoric performance is the measurement of the running performance of sportsmen, which can be directed to checking the speed and the endurance. A more precise characteristic is the result of the so-called Cooper test. As it is known, based on his experiments with running for different periods of time, professor Cooper found that the distance covered by different persons in 12 minutes correlates with the results of laboratory tests, i.e. it is in a sufficiently good correlation with physiological characteristics, and this test may be suitable to compare sportsmen with other sportsmen. A similar checking method is the fan test, in which the sportsmen have to run in a small ground, the lining of which is determined, and then this is evaluated. These tests do not require any special instruments, only a stopwatch and a running ground are needed.

For the objective testing of several elements of technical grounding, different measuring equipment's (tools) have already been used.

One of such technical elements is the ball shooting power, for the measurement of which there are elaborated several measuring principles.

The impact energy of the ball reaching the target can be measured, and from this, the shooting power can be derived according to patent US-4.749.184, in which on a supporting block, there is a horizontal arm stressed by a spring and having a bearing around a vertical axis and having a target disc at its end, the deviation of which, caused by the ball can be measured by optoelectrical sensors. In the instrument according to published description DE- 28 54 165, behind the frame of a normal size goal, a plane net is spanned, and the strength of the shot is indicated by the bending of the net.

The kicking power of the leg can be tested directly by an instrument known from the US-4.641.834 patent, in which at kicking, the deviation of a ball supported by a spring can be evaluated.

By using the instrument developed in US-4.563.005 and US-4.915.384 for baseball, the kicking power (force) can be derived from the speed of the ball, where two parallel planes are developed by infrared beams, and from the time needed for the ball's passing through the two planes, the speed (velocity) of the ball can be determined. This instrument can have also the form, in which only the farther plane from the player is developed, and a microphone sensing the sound of kicking substitutes the nearer plane.

Another measurable element is the accuracy of the shot.

The instruments mentioned above are suitable also for this purpose, as horizontal and vertical sensing planes are built of infrared beams, and the square net formed of infrared beams indicates the site for passing-through of the ball, and even the direction of its trajectory can be followed. The instrument described in patent US-5.556.106 works in a similar principle, where to four favored parts of the total area of the goal, photoelectric sensors are arranged in vertical directions, which are coupled to seizing and counting devices. With the

instrument according to published description DE-2 051 386, shots can be evaluated at the total surface of a normal-sized goal so that on the posts and above the bar, lines of electric sensors are placed, and the ball is covered with a material perceptible to these sensors.

The accuracy of a shot can be checked also by simpler means. In the instrument according to the already mentioned published description DE-28 54 165, a board provided with a square net and numeration is placed behind the net indicating the strength of the shot in the normal-sized goal, which makes the detection of the place of the shot possible, as well. In patent US-5.509.650 developed originally for ice hockey, a board of the goal size is described, on which target areas are formed provided with electric sensors detecting the hit of the disc. Published description DE-35 03 549 shows a device, in which the target elements are fixed to rotating columns or vertically running, bands. The instrument according to DE-38 32 613 is even more simple. It is a goal-shaped (eventually also -sized) board with two openings fitted to the size of the ball which can be rather considered as a target object. A very small goal is described in published description DE 29 15 386, in which a wobbling board is connected to a counter. Finally, the simplest devices are the sack-like nets described in patents US-4.615.528 or US-4.863.166.

For practicing more complex tasks and testing the quality of their execution, a system is seen in the patent US-4.654.458. In this system developed for rugby but also adaptable to football, two separate fields are built for players playing in different posts. On the one field, on which optical passing-through sensors and electric progression direction sensors operated by them are placed after each other, the running and direction changing skill of the attacking player can be developed and tested. The other field, developed for facilitating and testing

of the running and playing of the ball capacity of defensive players, is provided with optical passing-through sensors, throwing direction sensors and target objects. The system described in patent US-5.513.854 serves also for testing the movements of players, in which system the players (there are more players simultaneously in the system) are provided with radio transmitters, the signs of which are received by receivers placed on the side of the field, whereas signs of the ball are received by digital cameras, and a computer center establishes statistical values for the relation between the position, speed, acceleration, energy output of the players, and their relation to the ball. Finally, according to patent US-5.509.650 already mentioned, movement sensors are planted on the site before the ice hockey goal, thus the movements of players can also be evaluated.

In developing technical abilities it was always an important aspect that players could possibly practice alone, too. Therefore, to several elements of technical ability, first of all to shooting and playing of the ball abilities, instruments and devices making independent practice possible have already been constructed.

For developing the dribbling of ball and strait shooting ability, devices of different complexity can be applied, part of which have been originally elaborated for testing such skills of football players. As each practicing consists of the repeated execution of the task and its immediate testing, testing devices mentioned above can be used naturally also for practicing.

Simple devices which can be considered target objects also, in addition to the nets mentioned before, are sack-like nets seen in patent US-4.083.561, as well as the device shown in US-4.905.996, in which a net is spanned onto a frame, and a net-sack can be hanged in the middle of the net. The goal provided with

a net shown in patent US-4.083.561 is rather a target object than an instrument owing to its very small size.

In addition to the above-mentioned goals, the simplest is, of course, the normal goal. This can be completed with mechanisms assisting practice or evaluation. For example, in patent US-4.286.786 a goal is described containing a reflective board to ensure for the player that he could continuously practice in scoring goals alone. In the foreground of the goal consisting of a net spanned on the posts and of a board divided to fields behind it, as described in DE-28 54 165 already mentioned, a wobbling obstacle can also be planted, the wobbling of which simulates the diving of the goal-keeper. The wobbling obstacle is a man-size, puppet-like object, the bottom of which is convex, and its center of gravity lies so high that it can be wobbled like a tumbler, which automatically returns to its original vertical position.

Important tools for practicing scoring and ball handling are the different reflective elements, the simplest versions of which are plane boards and plane nets. Such are e.g. the vertically positioned board standing on legs, as is described in patent US-4.258.924, which is mounted on a stand with spring supports, and the plane net fixed to a metal frame with flexible elements as described in DE-32 22 185. In both cases, the flexible elements assist in changing the strength of the ball's bounce. The goal mentioned in US-4.083.561 can also be used for this purpose, the rear net of which is an inclined plane reflecting net (from the front goal, from behind reflective element), as well as the device described in US-4.905.996, which, without the hanging net-sack, can be used as a vertical plane reflective element.

It is known that from an inclining plane, the ball returns in different direction, depending on the place of incidence. Thus the player can bring himself in play

with the reflecting ball in different ways. Such reflective elements are introduced in patents US-4.421.318 and US-4.264.070 and in published descriptions DE- 31 06 135 and DE-27 58 290. These boards are essentially standing on earth or placed near to earth, they are either arching or prepared from more planes so that the curvature of the arch or the angle between the planes is variable. Also the position and direction of generating lines of the shape of the board can be varied, whether they are horizontal or vertical, reflective elements can be prepared in both cases. The tilting angle of boards can also be varied.

The plane board given in DE- 36 44 199 serves a similar purpose, whose simpler realization can be tilted relative to the vertical direction in different angles to the rear, but some are vertically divided into two to three parts, the planes of which can be tilted by joints. Patent US-5.054.791 describes three plane reflective elements placed in certain angles with respect to each other and joined by vertical hinges.

The incidental direction of the reflecting ball can be realized best by the reflective element described in patent HU-176.737 comprising of several planes and convex surfaces, and the board according to patent HU-193.929 having convex surfaces beside each other in more rows and columns.

Reflective net shown in patents US-5.039.109 and US-5.584.480 should be mentioned whose height can be adjusted and which net can also be bent relative to vertical direction.

Numerous instruments have been developed and applied fitting to the special task to be practiced. Such are, e.g. balls suspended or fixed in different manners for exercising kicking and heading.

A characteristic tool is e.g. the tumbler mentioned, which can also be applied in practicing dodging, or the instrument known from US. 3.637.210 in which a

suspender loaded with springs in a car movable on a path consisting of parallel wires hinges a man-size puppet. The instrument is developed for rugby, a man-against-man type fight where forced collisions are usual, and these can be practiced with this tool.

Solutions shown above are developed for assisting players in improving of individual elements of their technical skills, part of them is even only for improving the technical aids or broaden their choice. These, by themselves are suitable only for exercising basic tasks, but are not enough for practicing complex series of tasks occurring at matches or games consisting of much movement and different ball handling techniques.

More technical elements can be improved by the system described in patent US-5.647.747 which has been developed for ice hockey players to exercise dodging and forced collisions. In that, above the field, crossed and length-way, suspended, S-shaped paths are placed inside circular paths in several rows, in a horizontal plane, directly beside each other, on each of them a motor-driven carriage contains life-size puppets simulating the players. In the suspension there are several ball-joints with regulable rigidity. With this tool, the practice can not only be carried out, but the strength of the impact, its speed, duration of the task and the equilibrium of the player can also be measured.

This tool is serving well the technical training of players in this special branch of sport, however, in football different movements are necessary. The man-against-man type fight with collisions takes place in different series of movements, and it is rather favorable for the player to be able - owing to his technical skill - to avoid collisions. Though this solution is suitable for developing dodging and observing abilities, the movement prescribed by the shape of the suspended railway path (as to both, shape and width of the path) is character-

istic specifically for ice hockey and cannot be applied to football. In addition, in football, a significantly broader angle of vision is needed than in ice hockey, and puppets moving on a given path cannot improve this broader sight. A big drawback of this solution is its complexity. The suspended path system, in addition of being very expensive, is not variable, moving the puppets requires significant computer capacity.

A system applicable to exercising and testing the quality of execution of more complex tasks is described in patent US-4.645.458. In this system developed for rugby but adaptable to football as well, two separate pathways are present for players playing on different posts. On the one pathway, on which optical passing-through sensors and electric advancement direction detecting sensors activated by them are placed after each other, the running and direction-changing skill of the attacking players can be improved and tested. The other pathway, developed for the improvement and testing of the running and ball handling ability of defensive players is provided with optical passing-through sensors, throwing direction detectors and target objects.

Patent US-5.746.669 describes an arrangement developed for exercising more complex tasks too, in which the football player have to lead the ball through several gates of a size of 3-4 times of a ball diameter said gates not lying on a straight line, and then he should shoot the ball into a larger goal. In smaller gates, swinging boards indicates the passing through of the ball.

In the last three systems, practicing the handling of ball (disc), scoring and moving in the field is coupled in some way. The third arrangement, though it is the simplest of them, provides the most complex series of tasks, as it ensures the simultaneous exercising of leading the ball between obstacles and scoring, thus it can be considered the best solution. However, it cannot simulate real

situations occurring at matches either, since on the field, the opponent is also moving, thus the players should pass big, non-static obstacles.

These instruments can be placed on normal football fields, or smaller training fields, but they can also be used for developing training complexes, such as shown in patent application WO 96/16.708. This complex contains, in addition to halls for different condition training, 16 open-air training fields equipped for different technical tasks. On the first field, ball-leading on a narrow, winding passage, on the second one flying, directed shooting by means of horizontal, highly arched reflective elements, on the third, by means of a board provided with impact sensors, heading to the goal, on the fourth by means of columns, smaller goals and other landmarks, the leading of the ball, on the fifth scoring by means of a line of puppets, on the sixth scoring standing with the back to the goal by means of a big-arched reflective element, on the seventh net soccer by means of a tennis net, on the eighth diving heading and its defense by means of rubber mat and columns substituting the goal, on the ninth complex ball leading tasks by means of columns, puppets and reflective boards, on the tenth scoring by means of normal goals, on the eleventh the kicking of the ball by means of flexible reflective surfaces, on the twelfth long running pass and passing the ball by means of reflective boards, on the thirteenth scoring of the ball passed by the player in front of him, on the fourteenth the lobbing of the ball from the corner into the goal, on the fifteenth scoring of a ball arriving from behind or from the side can be practiced, and finally, on the sixteenth two players can play small-field, small-goal matches.

Though in addition to the already mentioned, a lot of tools have been used in this training complex (ball leading passage, big-arched, horizontal reflective element, ball gun, hurdling, tunnel, rubber tire, stairs - the role of which is not

quite understandable -, vertical big-arched reflective element, tennis net, ball-drop tube), more complex tasks can be performed only on several of the fields, and those are suitable only for improving ball dribbling - receiving the passed ball techniques or simple ball dribbling. A big drawback of this solution is that it does not simulate real situations corresponding to the nature of football and taking place on the field.

It is seen from this survey that the methods for testing physical condition elaborated until now are restricted to the study of only several characteristics related mainly to physical condition, such as the physical preparedness (grounding) of sportsmen, the measurement of which is already solved. However, they do not provide appropriate information about the state and dynamics of the muscle system, for judging the circulation characteristics and fitness. Thus, the special requirements arising in individual branches of sport, e.g. in football, the specific load of the characteristically loaded muscles or the whole body of the sportsman cannot be taken into consideration in the majority of branches of sport.

Similarly, it can also be established that the tools suitable for testing the technical skills are applicable only for the simulation of situations coupled with small movements and intentness, but they cannot provide information on the general technical grounding of the player, and at present, no arrangement is available for either testing, or practicing which would simulate sufficiently the multi-movement, multi-player situation, in which all players should be involved as often as possible. This means that they should simultaneously handle the ball, move together with it, size up the situation for passing or scoring the ball, and execute it.

The aim of the invention is therefore to develop a procedure and the arrangement necessary to it for studying the physiological characteristics and motoric skills in a single process, and, at the same time, obtaining information over the state of the skeleton and muscle systems, and even for the psychical state concerning load-tolerance.

The recognition that in the case of a well-chosen load, the loadability with movements of the body is influenced not only by the state of the muscle system, but also by the circulation-respiration power, led to achieving this aim. This means that the time required for performing a series of tasks can be considered a characteristic measure, like in tests developed for judging the physical state introduced earlier. In choosing tasks for examining sportsmen it is preferable to take into account the specific demands of a certain branch of sport, as well as the particular technical activities in a given sport. For example, in the case of football players, testing of the physical state should be extended to judging the vertical and horizontal efforts of leg muscles, to judging mobility and ease of steering, to judging speed of movement in straight forward and variable directions, and to judging the circulation and muscular characteristics for this specific endurance. It should be emphasized that a well-chosen series of tasks is applicable not only for testing the physical abilities of football players, but it can give a picture on the general physical state of anybody.

Another aim is to develop a procedure and the arrangement necessary to obtaining sufficient information on every element of the technical grounding of a football player in a single, possibly short-term test.

This aim could be achieved on the basis of recognizing the fact that with well-chosen series of tasks, the time needed for their execution is a characteristic measure (similarly to the so-called Cooper-test developed for judging the

physical state). In choosing the tasks, particular technical activities appearing in football should be taken into consideration, i.e. judging should extend to tests for passing-receiving, dribbling-dodging, flying kick and heading, and scoring skill. In the execution of well-chosen tasks, besides physical state, some conclusions can also be drawn to the psychical state, as the player being in a psychologically not satisfactory state requires more time for performing the tests due to different reasons (reduced concentration ability, cautiousness).

It is an important recognition, too, that testing of ball dribbling is misleading, if the player can follow his own and the ball's movements by sight, because sight, as sensing should be extended in the field to a significantly larger area. To this, head and eyes should be in an elevated position, in which leg and ball fall only on the area of peripheral sight. Thus, for testing, tools should be applied sensible only or mainly at a head- and eye position forced in the field.

Among objectives, the development of a technical solution was also involved by which all versions of the complex, multi-personal, multi-movement situations are practicable. The solution should be that - in contrast to traditional training, when the player performs dribbling by visual sensing - only pieces of information arriving from the different parts of the foot (inner instep, outer instep) are the relevant information pieces for the brain center governing activity (proprioceptive reflex). In addition, for exercising, obstacles simulating better the narrower movements and dodging situations characteristic for football are needed. It is an important task to ensure that practicing should extend not only to acquiring and keeping the ball, but also to utilization of the acquired ball (either by passing or by scoring it).

This multisided expectation cannot be satisfied so that practicing takes place only by several tools providing the same task, e.g. by only boards, puppets,

etc., or if it is directed only to dribbling or scoring. A complex task requires complex solution. The situation of nearing to the goal is best simulated by an obstacle element of small deviation, easy movement, and relatively easy avoidability. For this purpose, a loosely suspended bar in a vertical position is suitable, whereas the situation in front of the goal is better simulated by wobbling puppets, among which the player can pass by break through, dodging, or lobbing of the ball, or he can score among them, and by a suitable reflective element, side-passing the ball, receiving the back-lobbed ball and utilization of the lobbed ball can be exercised.

The number of tools for practicing should be enlarged. In situations before the goal often chopped or pushed down shots have to be applied. Practicing these should be performed by means pointing out the possible path of the ball. For this purpose, reflective elements can be used the board of which can be raised to different heights between two external holders, and the "window" through which the ball can be passed only by chopped or pushed down, is determined by the holders and the bottom edge of the plate.

For dodging and ball handling, particularly developed leg muscles are needed, and that cannot be achieved merely by muscle building tools (dumb-bells, conditioning machines, etc.). It is known that "technically skilled" players can play better on wet, slippery grounds than their fellow-players. This situation can be simulated for practicing purposes by a sandy ground.

The invention relates to an arrangement for testing the characteristics of physical condition of human body but first of all that of sportsmen, comprising at least two field sections on a flat surface, which arrangement consists of at least two sections of fields chosen from sections differently loading the human body by either of the sprint task, and/or of jump task, and/or of plain slalom, and/or

broad slalom, and/or sidling slalom, and/or of back sprint task, where all the sections have marked out starting and end points, and, in addition

- on the plain slalom section, at least further three points are marked out on a straight line,
- on the broad slalom section, three points are marked out on two sides of a straight line,
- on the sidling slalom section, at least three points are marked out on at least two straight-line sections connecting to each other with a certain an-gle, so that one point falls to the intersection of the straight-line sections, and the further points fall onto the straight-line sections,
- on the back sprint section, at least two points are marked out on two par-allel straight lines, and
- the field sections forming the arrangement are connected directly to each other so that the end point of one section coincides with the starting point of the next one, and finally
- time-keeping devices are applied in a known manner at the end and starting points of the sections for measuring times needed for passing between them.

In one of the preferred embodiments of the arrangement according to the invention, the end and starting points are provided with electric sensors coupled to electric timing devices.

Another preferred embodiment of the arrangement according to the invention is that on the field section of jump task, at least one measuring point is marked out on the line determined by its starting and end points.

A third preferred embodiment of the arrangement according to the invention is, when on the section of jump task, the distance between the measuring point marked out between the starting and end points and the end point corresponds

at least to the length of the deceleration section calculable from the whole length of the section and the acceleration and deceleration of the person to be checked.

In the fourth preferred embodiment of the arrangement according to the invention, on the section of sprint task, at least one further point is marked out between the starting and end point of the section, on the straight line determined by the starting and end points.

In the fifth preferred embodiment of the arrangement according to the invention, the one or more measuring points marked out on the section of sprint task are provided with electric sensors coupled to electric time-keeping devices.

The sixth preferred embodiment of the arrangement according to the invention is, in which on the section of sidling slalom task, the straight-line sections connect to each other in a W-form, and points are marked out on the straight lines and in the intersections, as well.

The seventh preferred embodiment of the arrangement according to the invention is that on the section of sidling slalom task, in the intersections of straight-line sections and at their end points electric sensors are placed coupled with electric time-keeping devices.

In the eighth preferred embodiment of the arrangement according to the invention, on the section of back sprint task, the points marked out are provided with electric sensors coupled to electric time-keeping devices.

In the ninth preferred embodiment of the arrangement according to the invention on the section of back sprint task, the points marked out on a single line are provided with sensors falling also on a single line, the so-called influence line, and the sensors are coupled to electric time-keeping devices.

In the tenth preferred embodiment of the arrangement according to the invention on the section of jump task, a leap is placed, which can easily be knocked down or pushed over at least in one direction.

In the eleventh preferred embodiment of the arrangement according to the invention more leaps are placed on the section of jump task, and they are arranged either parallel to each other and in a series.

In the twelfth preferred embodiment of the arrangement according to the invention the leaps are placed in two series on the section of jump task.

In the thirteenth preferred embodiment of the arrangement according to the invention on the section of jump task, a leap of adjustable height is placed.

In the fourteenth preferred embodiment of the arrangement according to the invention on the section of jump task, in the surrounding of the site pointed out for performing the task, an electric sensor is placed which is coupled to an electric time-keeping device.

In the fifteenth preferred embodiment of the arrangement according to the invention on the section of jump task, at least one sensor is placed in the surrounding of each, the starting and end point, which is coupled to an electric time-keeping device.

In the sixteenth preferred embodiment of the arrangement according to the invention on the section of jump task, a dynamometer -plateau and/or a device for detecting the rise in the center of gravity is placed.

In the seventeenth preferred embodiment of the arrangement according to the invention points are marked out by painting.

In a further preferred embodiment of the arrangement according to the invention points are marked by deflecting elements, preferably by deflecting cones.

Finally, in a preferred embodiment of the arrangement according to the invention the points are marked out by flexibly suspended obstacles by elements placed above the points.

The invention relates also to the procedure for testing the characteristics of the condition of human body, first of all that of sportsmen, in the course of which the person to be checked is loaded by different kinds of movement on a flat ground, in which procedure at least two of the following steps of procedure are chosen, in which

- in one step, the person to be checked is loaded by simple running on a field section of sprint task,
- in one step, the person to be checked is loaded by jumping on both feet on a field section of jump task,
- in one step, the person to be checked is loaded by a slalom movement, in a posture identical with the progression direction, by passing at least three points marked out on a straight line on a field section of plain slalom task,
- in one step, the person to be checked is loaded by a slalom movement by compassing at least three points from the side opposite to the straight line, in a posture identical with the momentary direction of movement, on a field section of broad slalom task,
- in one step, the person to be checked is loaded by a slalom movement on a field section of sidling task by compassing at least three points marked out on at least two straight-line section connecting in an angle, on their connecting points and on their ends between the points, or compassing them in the opposite direction relative to the other points in a constantly sidling posture independently of the momentary direction of movement,
- in one step, the person to be checked is loaded by running backwards between at least two points marked out on two parallel lines , or by com-passing

them from the side opposite to the point on the other line on a section of back sprint task,

- we measure the time spent by the person to be checked for the perform-ance of the chosen steps, between the starting and end points of each of the field sections, and

- we also determine the whole time spent altogether in the chosen steps on the field sections.

One of the preferred ways of execution of the procedure according to the invention is characterized in that on the field section of sprint task, the time spent by the person to be checked is measured between the starting point and one or more points marked out on the straight line determined by the starting and end points.

In another preferred way of execution of the procedure according to the invention on the field section of sidling slalom task, the time spent by the person to be checked is measured at points marked out in the end of straight-line sections and at their intersections with the neighboring straight-line section.

In the third preferred way of execution of the procedure according to the invention the time is measured spent by the person to be checked between each point marked out on the parallel lines and touched by the person on a field section of back sprint task.

In the fourth preferred way of execution of the procedure according to the invention on the field section of sidling task, the person to be checked is loaded by a slalom movement in a constantly sidling posture independently of the momentary direction of the movement, in compassing the points marked out on at least two straight-line sections connecting in a certain angle, at their intersection, at points on the end of straight-line sections and between these points,

compassing the end points in a direction opposite to the other points, the other points alternately.

In the fifth preferred way of execution of the procedure according to the invention the person to be tested is loaded by a forward motion carried out by jumping on both feet from the starting to the end point, on the field section of jump task.

In the sixth preferred way of execution of the procedure according to the invention on field section of jump task, the person to be tested is loaded by moving between the surrounding of the starting and end points in forward direction, sidling to the left and to the right by jumping with both feet.

In the seventh preferred way of execution of the procedure according to the invention on the field section of jump task, the person to be tested is loaded by motion carried out by jumping through leaps, which are preferably at least in one direction easily be knocked down or pushed over.

A further preferred way of execution of the procedure according to the invention is characterized in that the foot strength of the person to be tested is measured in the moment of the push off by both feet with a dynamometer plateau.

Finally, one of the preferred ways of execution of the procedure according to the invention is characterized in that on the field section of jump task, the difference between the heights of the center of gravity at standing and at flying jump with both feet for the person to be tested is measured by a device suitable for measuring the rise in the center of gravity.

The invention also relates to an arrangement applicable for testing the technical grounding of football players, and to the development of which flat reflective element, and/or goal, and/or suspended obstacle, and/or electric passing-

through sensor is used, in which arrangement

- it is composed of field sections providing different technical tasks, and having starting and end points, and
- the sections are directly connected to each other so that the end point of a section coincides with the starting point of the next section,
- each field section is surrounded by a fence, on which at the starting and end points openings ensure the free pass of the ball, and
- in a known manner, time-keeping devices are planted at the starting and end points measuring the time needed for passing through between them, and
- the arrangement comprises field sections chosen at least partly from among field sections, where
- on one field section, at least one kick-off site and at least one goal site is marked out, and a target object is placed on the goal site,
- on one field section, one kick-off site is marked out, and at least two flat reflective elements are placed whose axes intersect on their side showing towards the kick-off site, preferably in the neighborhood of the kick-off site,
- on one field section, at least one goal is marked out , with two reflective planes on its sides so that the axes of the two reflective planes intersect the axis of the goal, and the intersections fall on the goal side showing to the internal part of the section,
- on one field section, at least three points are marked out with suspended obstacles falling on one straight line, where these obstacles are vertical bars,
-on one field section, two points are marked out on each of at least three parallel lines, and finally
- on one field section, at least one kick-off and one goal are placed.

In a preferred embodiment of the second arrangement according to the invention the starting points and end points are provided with electric sensors, pref-

erably with photoelectric cells, which, in turn, are connected to electric time-keeping devices.

In another preferred embodiment of the second arrangement according to the invention on the field section comprising the kick-off and goal sites, more than one kick-off and goal sites are marked out so that a given goal site is situated in the neighborhood of a kick-off site belonging to another goal site.

In a third preferred embodiment of the second arrangement according to the invention on the field section comprising kick-off sites and goal sites, at least two kick-off sites and goal sites are marked out on each of two parallel lines.

In the fourth preferred embodiment of the second arrangement according to the invention the target objects placed on the goal site are known deflection elements, preferably deflective cones.

In the fifth preferred embodiment of the second arrangement according to the invention the target object placed on the goal site has a gate 1.5-2-times larger than the diameter of a football.

The sixth preferred embodiment of the second arrangement according to the invention is characterized in that on field section comprising two-two points on each parallel line, these points fall to the intersections of the parallel lines and two, perpendicular lines.

In the seventh preferred embodiment of the second arrangement according to the invention on field section comprising kick-off site and goal, the goal consists of a series of electric passing-through sensors.

In the eighth preferred embodiment of the second arrangement according to the invention on field with kick-off site and goal, between the kick-off site and the

goal consisting of a series of electric passing-through sensors, a further gate consisting also of electric passing-through sensors is placed.

A further preferred embodiment of the second arrangement according to the invention is characterized in that the field section comprising kick-off site and target object, and/or kick-off site and reflective element, and/or reflective element and goal, is provided with a sensor sensing at least the end points of ball movements, which sensor is coupled with a time-keeping device.

Finally, a further preferred embodiment of the second arrangement according to the invention wherein the device detecting the end points of the sections of ball movement is a microphone.

The invention also relates to testing the technical grounding of football players characterized in that at least two of the steps are chosen from among the following:

- in one step, on a field section comprising at least one kick-off site and at least one goal site, and a target object is placed onto the goal site, the player is let kick the ball from the kick-off site to the target object, and the time is measured spent on the field until a desired number of successful kicks - that is hitting the target object - have been achieved,
- in one step, on a field section comprising at least one kick-off site and at least two reflective planes the axes of which intersect on the side towards the kick-off site, preferably in the neighborhood of the kick-off site, the player is let kick the ball from the kick-off site to one of the reflective planes, take-over of the ball reflected and kicking it to the other reflective plane; and the time spent until a desired number of successful kicks is measured,
- in one step, on a field section comprising at least one goal with reflective planes on its both sides, the axes of which intersect the axis of the goal towards

the internal part of the field section, the player is let lob the ball to one of the reflective planes with instep, kick the lob the reflected ball into the goal while moving towards the goal, lob again the reflected ball to a reflective plane and then heading the lobbed, reflected ball into the goal, and the time spent on the field section for performing successfully the task is measured,

- in one step, on a field section comprising at least three points marked out with suspended obstacles, the player is let dribble the ball by slalom, i.e. compassing the hanging elements from the left and right, and the time spent on the field section is measured,

- in one step, on a field section comprising at least three parallel lines on each of which two points are marked out, the player is let compass the points from outside and dribble the ball in a slalom between the points marked out, the time spent on the field section is measured, and finally

- in one step, on a field section comprising at least one kick-off site and one goal, the player is let kick the ball from the kick-off site into the goal, and the time needed for a certain number of successful kicks -passing through the goal -is measured, and

- we measure the time spent altogether on the field sections chosen.

In a preferred way for executing the second procedure according to the invention on the field section comprising three suspended obstacles along a line, the player is let dribble the ball in a slalom from the right and the left, then let the player run without the ball, compassing the suspended obstacles in a slalom from the right and the left, and the times needed in both cases are measured.

In another preferred way for executing the second procedure according to the invention on the field section comprising two points marked out on each of at least three parallel lines, the player is let dribble the ball in a slalom by com-

passing the points from outside, and then perform the same running without the ball, and the times spent on the field section are measured in both cases.

In a third preferred way for executing the second procedure according to the invention on the field section comprising a kick-off site and target objects on the goal sites, times spent between successive kicks from the kick-off site are separately measured.

In a fourth preferred way for executing the second procedure according to the invention on the field section comprising kick-off site and target object, the times are measured between kicking-off the ball and arrival at the goal separately, as well as the times between the arrival of the ball and repeated kicking it off.

In a fifth preferred way for executing the second procedure according to the invention on the field section comprising kick-off site and reflective element, times are measured separately between individual kicks from the kick-off site, as well as at least until the last kick-off the ball, the time between the successive kick-offs of the ball and its arrival on the reflective plane.

In a sixth preferred way for executing the second procedure according to the invention on the field section comprising reflective element and goal, times are measured separately between the kick-off or heading of the ball and its arrival at the goal, as well as times between the repeated kick-offs or headings away of the ball bouncing back from the reflective element or the goal.

In a seventh preferred way for executing the second procedure according to the invention on a field section comprising at least one kick-off site and at least one goal consisting of a series of electric passing-through sensors, the passing of the ball through the goal is detected by the sensors, and the interval between the kick-off of the ball and its passing through the goal is measured.

In an eighth preferred way for executing the second procedure according to the invention on a field section comprising a gate consisting of a series of electric passing-through sensors and a goal, the player is let kick the ball through both, gate and goal with the same kick, and the time spent until making a certain number of successful kicks - passing through the goal - is measured.

In a ninth preferred way for executing the second procedure according to the invention on a field section comprising a gate consisting of a series of electric passing-through sensors and a goal, the time between passing the ball through the electric gate and the goal is measured.

In a tenth preferred way for executing the second procedure according to the invention on a field section comprising a gate consisting of a series of electric passing-through sensors and a goal, the speed of the ball is measured between the gate and the goal.

In the eleventh preferred way for executing the second procedure according to the invention on a field section comprising a kick-off site and a goal, the time between the passing of the player through the starting point and the first kick-away of the ball, as well as between the last kick-away of the ball and the passing the player through the end point are measured.

In a the twelfth preferred way for executing the second procedure according to the invention on a field section comprising kick-off site and target object, the kicking away of the ball is let done by the player once with his right, and once with his left leg from the kick-off site to the target object, and the time for performing a certain number of successful kicks - hitting the target object - is measured.

In a thirteenth preferred way for executing the second procedure according to the invention on a field section comprising kick-off site and reflective elements,

kicking is performed once with the right, once with the left leg of the player, the ball is kicked from the kick-off site to one of the reflective planes, the ball coming back from the first reflective plane is then taken over and kicked to the other reflecting plane, and for both legs the time needed for performing a certain number of successful kicks is measured.

In a further preferred way for executing the second procedure according to the invention is characterized in that on the field section comprising reflective element and goal

- the football player is let lob the ball with the inset to the reflective ele-ment, then moving towards the goal, kick the reflected, bouncing ball into the goal, lob the reflected ball to an arbitrary reflective element, then lob again the reflected ball into the goal, once with his right, once with his left leg,
- the football player is let once lob the ball to an arbitrary reflective ele-ment with the inset, then, while moving to the goal, heading the ball into the goal, lob the ball again to a reflective element, then heading it again into the goal,
- the time spent on the field section successfully performing a certain number of kicks and headings with the right and left leg is measured.

Finally, another preferred way for executing the second procedure according to the invention is characterized in that on a field section comprising a gate consisting of a series of electric passing-through sensors and a goal, the player is let pass the ball by one kick through the gate and the goal with his right and left leg, the passing-through of the ball is checked by the sensors, and in both cases, the time spent on the field until achieving a certain number of successful kicks -passing through both gate and goal - is measured.

The invention also relates to an arrangement applicable to improving the technical grounding of football players which comprises one or more training

grounds simulating technical situations of different kinds and comprising, in the given case, at least one of the following on each: goal, and/or suspended obstacle, and/or wobbling obstacle, and/or reflecting element, and/or reflective element provided with a mechanism deflecting it from the perpendicular direction, and/or reflective element providing with a mechanism for changing its height. In the arrangement

- on one training ground, at least one goal site, wobbling obstacles, reflective elements, and above the training ground, preferably parallel to the straight line passing through the goal, straight, horizontal holders, with hanging obstacles suspended by flexible joints on the holders are placed, and at least, one reflective element is planted on each of both sides of the goal,
- on one training ground, at least one goal, and above the training ground, straight, horizontal holders preferably parallel to the straight line passing through the goal are placed, on which holders hanging obstacles are suspended by flexible joints,
- the hanging obstacles are on each training ground vertically positioned bars,
- on one training ground, at least one goal and reflective elements provided with mechanism deflecting them from the vertical direction are placed,
- on one training ground, at least one goal and at least one reflective ele-ment provided with a mechanism for changing its height are placed, the reflecting plate of the reflective element is held by two brackets on its both sides,
- on one training ground, at least one goal is placed, and the ground is covered by a grained material, and finally
- an empty ground is surrounded by a fence providing a soft boundary.

The first preferred embodiment of the third arrangement according to the invention is characterized in that above each of the training grounds equipped with suspended obstacles, at least two horizontal holders are placed.

In another preferred embodiment of the third arrangement according to the invention above any of the training grounds equipped with suspended obstacles placed towards the goal site, the distance between the two horizontal holders being on the sides is larger than the width of the goal.

In the third preferred embodiment of the third arrangement according to the invention on the horizontal holders above any of the training grounds equipped with suspended obstacles, at least four suspended obstacles are hanged on each.

In the fourth preferred embodiment of the third arrangement according to the invention on training grounds equipped with wobbling obstacles, at least four wobbling obstacles are placed on any of the grounds.

In the fifth preferred embodiment of the arrangement according to the invention at least two reflective elements are planted on grounds comprising goal site, wobbling obstacles, reflective elements and suspended obstacles.

In the sixth preferred embodiment of the third arrangement according to the invention the training ground comprising goal site, wobbling obstacles, reflective elements, and suspended obstacles, the axes of the reflective elements intersect the axis of the goal, and the intersections are on the internal side of the training ground relative to the goal site.

In the seventh preferred embodiment of the third arrangement according to the invention the reflective elements on a ground equipped with wobbling obstacles, reflective elements and suspended obstacles are provided with a mechanism deflecting them from the vertical direction.

In the eighth preferred embodiment of the third arrangement according to the invention on a ground comprising at least one goal and reflective elements pro-

vided with a mechanism for deflecting them from the vertical direction, at least two reflective elements are planted.

In the ninth preferred embodiment of the third arrangement according to the invention on a ground comprising at least one goal, and reflective elements provided with a mechanism for deflecting them from the vertical direction, the axes of the reflecting elements intersect the axis of the goal, and the intersections fall on the internal side of the ground relative to the goal.

In the tenth preferred embodiment of the third arrangement according to the invention the grained material applied on the ground is sand.

In the eleventh preferred embodiment of the third arrangement according to the invention except for the empty training ground surrounded by a soft fence, the fences of the other training grounds are suspended onto their holder by flexible elements.

In the twelfth preferred embodiment of the third arrangement according to the invention except for the ground surrounded with a soft fence, on any of the training grounds, to the bottom of the fence or in front of it, reflective elements are placed.

In the thirteenth preferred embodiment of the third arrangement according to the invention the fence of the training ground surrounded with a soft fence is a flexible net fixed to holders which are placed outside of the plane of the fence or above it by flexible elements.

In a further preferred embodiment of the third arrangement according to the invention the fence of the ground surrounded with a soft material is a flexible net, the actual height of which is larger than the distance measured in its hanged position between its top side and the ground.

Finally, a preferred embodiment of the third arrangement according to the invention is characterized in that the fence of the ground surrounded by a soft material is a flexible net, the actual height of which is smaller than the distance between its upper side and the ground, and only its upper side is fixed.

The invention relates also to a suspended obstacle element applicable in testing some elements of the physical condition of human body, and/or checking the technical grounding of sportsmen, and/or improving the technical grounding of football players. According to the invention the suspended obstacle is a vertically positioned bar suspended with its upper end on a horizontal holder in a known manner by a flexible joint enabling the bar to deflect in any direction.

In a preferred embodiment of the suspended obstacle according to the invention, the flexible elements are placed on crossed horizontal holders.

In another preferred embodiment of the suspended obstacle the horizontal holders carrying the obstacles are nets.

Finally, the invention relates also to a reflecting element aimed to improving the technical skills of football players, which is of adjustable height, it is provided with some reflecting plate and is characterized in that it has two, vertically positioned brackets on both sides, onto which the reflecting plates are mounted by releasable joints applicable anywhere or on fixed positions in a known manner.

The procedure and arrangements according to the invention can be understood in more detail on the basis of examples showing the arrangements in the whole and in detail. The figures enclosed assist understanding, where

Figure 1 shows the top view of the field section of sprint task suitable for testing conditional parameters,

Figure 2 shows the top view of field section of jump task,

Figure 3 shows the version of field section of jump task provided with leaps, in top view,

Figure 4 shows the top view of the field section of plain slalom task,

Figure 5 shows the top view of the field section of broad slalom task,

Figure 6 shows the top view of the field section of sidling slalom task,

Figure 7 shows the top view of a version of the field section of sidling slalom task,

Figure 8 shows the top view of another version of the field section of sidling slalom task,

Figure 9 shows the top view of the field section of back sprint task,

Figure 10 shows the top view of a version of field section of back sprint task,

Figure 11 shows the top view of another version of field section of back sprint task,

Figure 12 shows the top view of a possible version of the arrangement suitable for testing conditional parameters,

Figure 13 shows the top view of the version of field section of sprint task provided with measuring points and movement-sensing elements,

Figure 14 shows the top view of field section of jump task provided with dynamometer plateau and a device measuring the rise in the center of gravity,

Figure 15 shows the perspective picture of suspended obstacles suitable also for marking out points on the field section,

Figure 16 shows the top view of one of the field sections suitable for testing the technical skills of football players,

Figure 17 shows the top view of a version of the previous field section,

Figure 18 shows the top view of another field section,

Figure 19 shows the top view of a further field section,

Figures 20-21 show the top and side views of a fourth field section,

Figure 22 shows the top view of a fifth field section,

Figure 23 shows the top view of a version of the previous field section,

Figure 24 shows the top view of a sixth field section,

Figures 25-26 show the top and (partly broken out) side view of a version of the sixth field section,

Figure 27 shows the top view of the arrangement of a possible version suitable for testing the technical skills of football players,

Figure 28 shows one of the training grounds suitable for improving the technical skills of football players, in top view,

Figure 29 shows the sight of the internal part of the previous training ground,

Figure 30 shows another training ground in top view

Figure 31 shows a third training ground in top view,

Figure 32 shows a fourth training ground in top view,

Figure 33 shows a fifth training ground in top view,

Figure 34 shows a sixth training ground in top view,

Figures 35-36 show a seventh training ground in top and side views,

Figure 37 shows a possible version of an arrangement suitable for improving the technical skills of football players in top view,

Figures 38-39 show the reflective element according to the invention in top and side views

Figure 40 shows the side view of a version of a reflective element, and

Figure 41 shows the side view of another version of a reflective element.

Before describing the arrangement shown in Figs 1-14 suitable for testing physical condition in detail, it should be emphasized that though the arrangement and instrumentation constructed to it according to the invention is suitable for testing anybody, as the examples to be mentioned concern first of all sportsmen, instead of "person to be tested", "football player" shall be mentioned for sake of simplicity.

However, this, of course, does not restrict the application field of the invention to sportsmen. Corresponding to the application field pointed out, field sections in Figures 1-11. and 13-14. are developed for testing characteristics of physical condition so that the person to be tested, e.g. the football player, is loaded simultaneously on his musculature and circulation system.

Before showing the individual field sections in detail, it can be established for all the field sections that, as the arrangement serve first of all sport purposes, it is obvious that its ground of field sections could be the usual, such as slag, plastic, lawn, artificial lawn, etc., but of course, other materials as well. The strict connection with sport is also demonstrated by the fact that just like sport fields, they are also provided with a boundary line, the field sections can also comprise boundary lines, however, they do not play a role from the viewpoint of the invention.

A more important, essential question concerning all field sections and the whole arrangement is the measurement of time. As it was already mentioned in the general description of the invention, the basic measure in testing the state of condition is the time necessary for carrying out the tasks on the field sections. Thus, time measuring is an indispensable element in the arrangement.

Since -to be seen later - the tasks are set up so that they last from the entrance till leaving the individual field sections and the whole arrangement, and that dead time should be small in order not to influence the result, only the time spent between entrance and leave should be measured. This can be done even with the simplest device, a stopwatch. However, to achieve higher measuring accuracy, it is more preferable to use an electric (or rather electronic) watch coupled to electric sensors. The task of the sensor is to give a sign when detecting the presence or passing through of the person to be tested. Any known device, e.g. photoelectric cell, infrared sensor, etc. can be applied, or an electromechanical solution is also possible applied in several branches of sport, e.g. in skiing (a bar at knee height and rotating horizontally operates the switch of the time measuring device).

It is also clear from the general description of the invention that the essence of the procedure consists of loading the person to be tested in different manners, and measuring the time needed for performing the task. Taking into account that the essence of time keeping has previously been mentioned, in what follows, only the description of field sections and tasks is necessary. For sake of better lucidity, it is expedient to introduce field sections and tasks to be carried out on them in parallel.

The field section in Fig. 1 has only one starting point 1i, and one end, 1v, point. According to the given task, football player17 should run through the field section 1 in a straight line in direction 18, i.e. that field section is that of sprint task.

The second field section 2 shown in Fig.2 can be shorter than the previous one, and also has a starting point, 2i, and an end point, 2v. Virtually there is no difference between sections 1 and 2, however, later on it will be seen that not

only the task is different, but also section 2 can be completed with other specific tools, thus section 2 can be considered different.

The simplest task which can be carried out on section 2 is that football player 17, arriving in a run from starting point 2i at about the middle of field section 2 performs a certain number of jumps by both feet, then he leaves the section running through end point 2v in direction 18. Thus, field section 2 is the so-called field section of jump task.

The task on field section 2 can be carried out in several versions of different difficulty.

(As to the difficulty of tasks, a notice should be made valid for this and other field sections. Making the tasks more difficult means that football player 17 have to perform a longer task or a more diversified series of tasks, what increases the load. On increasing the load, the accuracy of tests increases as well.)

In the first version, football player 17 arriving running to starting point 2i, should cross the whole distance between starting point 2i and end point 2v in a straight line, by jumping with both feet, and may leave the section running through end point 2v. This task can be essentially identical with the basic task concerning load, if the number of jumps is identical in both cases.

In the second version, which is a more difficult task, a football player 17 after getting to end point 2v by jumping on both feet, turns to the side and performs jumps with both feet in sidling back to starting point 2i, then in the same position jumps back to end point 2v, then leaves the section running. (Thus football player 17 has to jump sidling first to the right, then to the left.)

Essentially the same load can be ensured for all football players 17 in both versions, if field section 2 is modified so as seen in Fig.3, where in each of two rows, 5 leaps 7 are placed. In this arrangement, the second version of task is performed by football player 17 so that by moving to the direction of end point 2v, he jumps with both feet through one row of leaps 7, then by sidling to the other direction, the second row of leaps 7, and then again to the direction of end point 2v, the first row of leaps 7. For the first version of the task only one row of leaps 7 is needed. The number of leaps 7 can in principle be chosen arbitrarily, it is influenced practically by the length of field section 2, and on the length of jump with both feet performable continuously. (In Fig.3 further tools to be discussed later are also shown.)

The construction of leaps 7 does not relate to the invention. A basic requirement is that they can be knocked off or pushed over unhindered at least in one direction, in order to avoid accidents. Thus, leaps formally identical with the hurdles used in athletic hurdling can be applied, only lower than those, or similar to those used in high-jump, i.e. a cross bar on two standers. The latter has the advantage that its height is adjustable.

On field section 3 in Fig.4, in addition to starting point 3i and end point 3v, further points 9 are marked out falling onto straight line 8. Three points 9 are already enough, but by increasing their number, the accuracy of the test can be improved. This can be generalized for other field sections, too.

Football player 17 has to cross starting point 3i by running to direction 18, compassing alternately from the right and left points 9, he has to run through field section 3 (on so-called field section of plain slalom), then he has to leave at end point 3v. It can be seen from Fig.4. that football player 17 slaloms be-

tween points 9 so that he only steps out to the right and to the left, not changing his posture relative to direction 18.

On field section 4 shown in Fig.5, in addition to starting point 4i and end point 4v, three points 11 are marked out; they fall alternately on both sides of straight line 10.

Football player 17 arriving running through starting point 4i, have to run to direction 18 by compassing points 11 alternately from 0the right and from the left on field section 4 (i.e. on the field section of broad slalom). Thus, here football player 17 has to change his posture corresponding to the curves during slaloming. After the last point 11, football player 17 leaves the field section by running through end point 4v.

Field section 5 shown in Figure 6 is the simplest version of the so-called field section of sidling slalom. In addition to starting point 5i and end point 5v, three points 13 are marked out so that they fall on the intersection and ends of two straight-line sections 12 connected in a V-shape. (Other tools are also shown in Fig.6, they will be discussed later, similarly to Fig.3.)

Football player 17 has to compass alternately points 13 so that his posture does not change relative to the straight line determined by starting point 5i and end point 5v, he moves only by sidling steps to direction 18. He arrives running to starting point 5i, and leaves running through end point 5v.

The task can also be performed so that football player does not compass points 13, but he is only sidling from point to point through field section 5. For this purpose, points 13 should be placed farther from each other, and in this case it is advantageous, if some instrument is placed on points 13 in a way described later, which have to be touched by football player 17.

The load of football player 17 on field section 5 of sidling slalom task can be increased in different ways.

One of the possibilities is that on straight-line sections 12 further points 13 are marked out (it is not shown in the figure). Football player 17 passes the in-between points 13 on straight-line sections 12 alternately before and behind them, in sidling.

Another possibility is shown in Fig.8. In this case, to the former two straight-line sections 12, further two sections 12 are connected. Individual straight-line sections enclose angles, thus the arrangement shows a W-shape. Points 13 are marked out at the intersections of straight-line sections 12 and at the end of the two external lines. This is essentially a simple multiplication of the basic version, thus the task here can also be performed by sidling from point to point.

On field section 6 shown in Fig.9, in addition to starting point 6i and end point 6v, two points 16 are placed. (The further elements shown in Fig.9 will be discussed later, similarly to Fig.3.)

Football player 17 runs in at starting point 6i, runs up to the first point 16, turns and then running backwards to direction 18 runs up to the other point 16, then turns again and at end point 6v runs out of field section 6 (which can be called a field section of back sprint task).

If the place available for field section 6 is smaller, points 16 can also be placed in the way shown in Fig. 10. In this case, football player 17 does not have to turn at points 16.

In Figure 11 it can be seen that on field section 6 of back sprint task, more points 16 can be placed. Points 16 fall onto parallel straight lines 14 and 15. In this case, football player 17 has to pass field section 6 by running backwards in

a zigzag-line. The test can be carried out so, too, that football player compasses points 16. (For visualizing the general placement of points 16, straight lines 14 and 15 are shown also in Figs9 and 10, but in the case of two points16, it has no importance whether they fall simultaneously also on parallel straight lines 14 and 15.)

As it has already been mentioned, the measure of performance on all field sections is the time spent between passing through starting points 1i, 2i, 3i, 4i, 5i, 6i and end points 1v, 2v, 3v, 4v, 5v, 6v measured by an appropriate time-keeping device, e.g. stopwatch.

From field sections 1-6 shown different arrangements can be constructed. It is not necessary that the arrangement includes all field sections 1-6, neither has their sequence a too great importance. The viewpoint at choosing is, which condition characteristics should be tested. For testing the physical grounding of sportsmen a more difficult, more complex arrangement providing greater load is required than e.g. for testing people recovering from some illness or injury. Even in this latter task can be differentiated between test arrangements built for testing people recovering from leg injury or other illness and those recovering from circulatory diseases. In the former case slalom-type, whereas in the latter, rather sprint-type tasks may predominate.

An example for the arrangement developed particularly for testing the physical condition of football players is shown in Fig.12.

The sequence of field sections is the following: field section of sprint task 1, field section of jump task 2, field section of plain slalom3, field section of broad slalom 4, field section of sidling slalom 5, field section of back sprint task 6. Corresponding to the sequence, end point 1v and starting point 2i; end point 2v and starting point 3i; end point 3v and starting point 4i; end point 4v

and starting point 5i; end point 5v and starting point 6i coincide. Each of the 1i-6i starting points and 1v-6v end points is provided with sensor 19, which are, in the present case, photoelectric cells. Sensor 19 is coupled to a time-keeping device TM. Time-keeping device TM measures separately the time of passing through for each field section 1-6, and transmits the data into a computer. The PC computer summarizes the times needed for carrying out the tasks on field sections 1-6, and the processed data are stored for each football player separately, thus, the data can immediately be compared with earlier ones, or, if it is available, with the standard.

The formerly discussed principles are realized for field sections 1-6 in the following manner.

On the field section of sprint task 1, the length of which, L1, is 20 m, and on the field section of jump task 2, the length of which, L2 is 10 m, there are no other tools placed.

The length L3 of field section of plain slalom 3 is 15 m. On straight line 8, eight points 9 are marked out. The distance, T1, between neighboring points 9 is 1.5 m.

The length L4 of field section of broad slalom is 15 m. On both sides of straight line 10, eight points 11 are marked out so that their distance, T2, from straight line 10 is 0.5 m, whereas the distance, T3, between subsequent points 11 is 1.5 m.

The length L5 of field section of sidling slalom 5 is 20 m. On the two straight-line sections 12 forming the V-shape, three points 13 are marked out. The distance, T4, between neighboring points 13 is 6.0 m.

The length L6 of field section of back sprint task 6 is 20 m. The distance, T5, between straight lines 14 and 15 is 7 m, there is one point 16 on both of them.

It follows from the data that the whole length of the arrangement LK is 100 m. At comparing this to the size of a football field, it is obvious that the performance of the football player as measured in time, when he performs the tasks on field sections 1-6 with maximum intensity, expresses appropriately the state of his physical condition from both muscular and circulatory aspects. The sizes given here are, of course, not compulsory to apply, even it can be necessary to deviate from them depending on the number of points.

Only as suggestions, and in the first line for testing football players, following data can be proposed for individual sizes: lengths L1, L3, L4, L5 and L6 between 3 and 30 meters, length L2 between 3 and 10 meters, distances T1 and T3 between 0.5 and 2.0 meters, distance T2 between 0.3 and 1.0 meter, whereas T4 and T5 are preferably chosen as at least 2.0 meters.

If on field section of jump task 2, leaps 7 are also placed, their height is suggested to be 0.3-0.6 m, the distance between them, T6 in Fig. 3, 0.5-1.5 m, and so many should be placed from them, for as many there is room enough in length L2 and distance T6 on field section 2.

If on field section of sidling slalom 5, there are points 13 marked out on straight-line sections 12 besides their end points, the distance between them, T7 as shown in Fig.7, may be 0.5-2 m.

An aspect for choosing the length and distance values from among the given size range can be e.g. whether the arrangement is developed for testing children or adults. It should be pointed out that e.g. in performing the slalom tasks, the result is also influenced by the rhythm of motion, which, in turn, is influenced by the relationship between step length and the distance between the

points to be compassed, or the practicability of jumping is influenced by the body dimensions of the person to be tested.

It should also be noticed that the whole length, LK, of the arrangement should always be between 75 and 100 m, even if it is developed not for testing football players and it does not comprise all field sections. The explanation for this is that the difference between loadability of persons does not show during a too short load, and especially not in the time needed for the performance. On the other side, a too long loading is an unnecessary overstrain for the person tested, and at the end of loading the body is already overtired which fact falsifies the result.

From similar consideration it may also be suggested that the field section of sprint task should be the first one, and the field section of jump task at most the second one.

By means of the arrangement shown, with some technical complementation, individual special characteristics of conditional state can also be measured.

On field section of sprint task 1, the time spent between passing starting point 1i and end point 1v is only an average value, as football player 17 accelerates in the first part of field section 1, whereas in order to be able to perform faultlessly on the next field section, he will decelerate in the second part. (Actually, it is not possible to accelerate to the maximum sprint speed on field section 1, as, according to experience, this would require at least 30 m, but it is not worth forming such a long field section 1.) This means no problem from the viewpoint of evaluation, but it does not provide the value of accelerating capacity. If this is also needed, then field section 1 should be developed e.g. in the way shown in Fig. 13.

Measuring points are marked out on the straight line connecting starting point 1i and end point 1v, whose number depends on the aspects according to which we want to test the acceleration capacity. If only the average value of acceleration is needed, then only one measuring point is necessary, at the beginning of the deceleration part, point 20 lying nearest to end point 1v. In determining the length of the deceleration part, the highest expected deceleration value should be considered.

Players in ball games usually have to pass a smaller distance with acceleration as needed for reaching the maximum running speed, thus their capacity to accelerate on these small distances is more interesting. If we want to measure that too, then one or more further measuring points 21 should be placed in the acceleration section between starting point 1i and point 20. The distances of measuring points 20, 21 from starting point 1i should be chosen on the basis of the motion patterns characteristic for the particular ball game. In case of football players, if the length of field section 1 L1 is 20 m, the distances of points 21, T9 and T10 should be marked out as 5 and 10 m, respectively, the distance of point 20 from end point 1v T8 as 5 m, too.

It should be noticed that as in this measuring task (as well as in others described later), relatively short sections are involved, the accuracy of stopwatch, or rather that of its operator, is not enough, therefore different timing devices should be applied. For example, at each of measuring points 20 and 21, one sensor 19 connected to a timing device TM can be placed. (If an electronic timing system is already developed for internal points, naturally starting point 1i and end point 1v can also be provided with sensor 19, which can also be coupled to timing device TM, and this, in turn, with the computer system.)

On field section of jump task 2, complementing measurements according to different aspects may be performed. If, according to the task, at the middle of section a determined number of jump-ups should be carried out, sensors may be placed about half a step before and behind each of the jumping sites (not shown in the figure). If section 2 should be passed on a straight line by jumping with both feet, this task can be performed in a relatively uniform rhythm in the whole length of field section 2, thus the time needed for passing through between starting point 2i and end point 2v is the real time of the task.

In case the task consists of three parts, i.e. from jumping in a straight line and sidling with both feet in two directions, the part-times of the three sections should be measured separately as well, as their comparison provides evaluable information. (It is known that the performance of people in different directions, e.g. in sidling to the right and to the left, is usually not the same.) If time is measured by using a stopwatch, no other technical means are needed.

If the measurement should be carried out more accurately, then further two sensors 19 should be placed at the end points of field section 2. Preferably, they may be placed on the same side as starting point 2i and end point 2v, with a parallel influence line, as shown in Fig.3. The course of measurement can be well followed in Fig.3: football player 17 runs in through starting point 2i, performs the task by jumping the leaps 7 to the right of him in straight line, runs away before sensor 19 placed at side of end point 2v, performs sidling jumps to the right on the second row of leaps 7, runs away before sensor 19 at the side of starting point 2i, then performs sidling jumps to the left on the first row of leaps 7, and finally leaves field section 2 by running through end point 2v. Sensors 19 are coupled to timing devices TM (not shown) in the known manner.

Special devices can be placed on field section 2 for measuring also the individual components of jumping capacity. Such are e.g. dynamometer plateau 22 or the device for measuring the rise in the center of gravity 23, which are indicated in Fig. 14. Both devices are known, but for sake of lucidity, it should be mentioned that dynamometer plateau 22 is essentially a balance measuring the leg-strength at push-off, whereas device 23 measuring the rise of the center of gravity is a column containing horizontal plates from two meters on, which can be rotated, and is provided with uniform scaling. Football player 17 should rotate the plates at jumping up with his raised arms, indicating thereby the height of his jump. (The task of this device is principally to measure the difference between the position of center of gravity for the football player in standing position and in the height he reaches by jumping up. Since, however, the center of gravity is difficult to identify other points of the body being or keepable in identical distance from it in standing and during motion may also be used for this purpose. The arm can be kept in a raised position in standing and at jumping, thus their distance does not change, the rise in the arm is identical with the rise in the center of gravity.) Both, dynamometer plateau 22 and device for measuring the rise of the center of gravity 23 may be provided with electric sensors, which in turn, may be coupled to an electronic jump-evaluating unit FM. The data of jump-evaluating unit FM can be transmitted into a computer (not shown), where they are processed similarly to time data.

For the already mentioned reason, moving to the right and to the left on the field section of sidling jump 5 can also be evaluated. For this, sensors 19 are placed to the intersections and at the end points 13 of V-shaped straight-line sections 12 shown in Fig.6, which sensors are coupled to time measuring device TM (not shown). Perceptible deviation is only detectable if the distance of points 13 is large enough, and/or there are further points 13 marked out on

straight-line sections 12. If points 13 are arranged in a W-shape shown in Fig.7, sensors (not shown) should be placed at each intersection of straight-line sections 12. To the contrary, in the arrangement shown in Fig.8, points 13 falling on one straight line, each task section can be measured by sensors (not shown) whose senders and receptors are placed outside the two external points 13 falling to the straight line.

In the arrangement of field section of back sprint task 6 shown in Figs.9 and 10, the time not spent for performing the actual task (dead time) can make half of the whole time between starting point 6i and end point 6v, i.e. the time for passing from point 6i to the first point 16, and from the second point 16 and end point 6v. In the embodiment shown in Fig.11, this ratio is improved to an extent depending on the number of points 16 marked out, but even in the case of five points 16 on each section, it still makes 10%. Thus, in this case, it is reasonable to be able to measure the actual time spent for the task itself, as well. The solution is here also the application of sensors 19 placed at individual points 16. In the embodiment shown in Fig.11. - similarly to the version of field section of sidling slalom 5 shown in Fig.8. - for measuring separate task sections it is enough to use sensors (not shown) the sender and receiver of which are placed on straight lines 14 and 15, outside the two most external points 16 falling to these lines.

It should be mentioned that though the description of sensors 19 allowed the conclusion for the necessity of applying devices to which senders and receivers are needed, e.g. photoelectric cells, it should be pointed out again that any sensor is suitable developed for sensing the nearing to or passing a point. At this point this is of importance, because e.g. on field section 6, at performing the back sprint task, it is not by all means necessary to pass through or pass by

point 16 marked out, or at standing jump(s) on field section 2 to measure the time spent on a given place, thus the infrared detector indicating also nearing can be preferably used.

It should be emphasized that the measure of the state of condition tested according to the invention is -even in case of performing the before mentioned complementary measurements - always the time spent for the performance on individual field sections and their sum. At the same time, a measure may also be developed into which results of the complementary measurements are also built in. No general guide can be given for this, it should always be considered which particular requirements made the measurement necessary. Correspondingly, any evaluation system is usable, from simple summing up, through weighed summing up, until the point system.

As to the embodiment of the arrangement, two further technical questions should be taken into account.

Starting points 1i, 2i, 3i, 4i, 5i, 6i and end points 1v, 2v, 3v, 4v, 5v, 6v are essentially marked out with painted lines, but in order to improve the accuracy of measurements it is expedient to use sensors 19. When applying those, there is no need for other marks.

The other problem is the marking of points 9, 11, 13 and 16. In the first line it should be pointed out that when we speak about marking of points, these points are not points in the mathematical sense, i.e. points having no extension. (Naturally, straight lines 8, 10, 14 and 15, as well as straight-line sections 12 should not be marked out, these are only theoretical sites.) It is well seen from the description of the tasks to be carried out that markings should be used, which can be well seen, but are easily to pass round. The simplest solution is painting them, like on sport fields. The sign marked can be of circular, square,

star or cross form, i.e. any small-size, plane figure. Deflecting elements used in traffic (deflecting cones or buoys) may also be applied. Painting can also be combined with other marking methods.

A special possibility of marking is offered for field section of broad slalom 4 seen in Fig.5. Since points 11 should be passed from the opposite side relative to straight line 10, as to the task, the zone between point 11 and straight line 10 is a dead area. Thus points 11 can be marked by painted half-lines intersecting straight line 10 perpendicularly, the end of which half-lines coincides with the given point 11. Above the half-line, low, board-like elements may also be placed. Here should be noted that on both sides of straight line 10, points 11 can be marked out also in pairs. In this case, the task can be started to both, to the right and to the left direction. In such an arrangement, points 11 may be marked by straight-line sections intersecting straight line 10 perpendicularly, and the end points of them coincide with symmetrically arranged points 11.

For marking out points 9, 11, 13 and 16, suspended obstacles 26 seen in Fig.15 may also be applied. This is essentially a vertical bar, which is hanged on horizontal holder 24 above e.g. field section 3, and suspended above point 9 (or above any of points 9, 11, 13, 16) by a flexible joint 25 ensuring unhindered deviation.

Horizontal holder 24 is placed in a height that football player 17 can pass under it, and it is a bar, in the embodiment shown in Fig.15. Its two ends are fixed to two leg-supports 27, but in other arrangements, more columns, or if the arrangement is in a gymnasium, its wall can also serve the purpose. It will be seen later that the bar forming horizontal holder 24 may be provided with a series of borings 28 falling on a straight line - as shown in Fig.21 - or that horizontal holder 24 can also be a wire - as in Fig.29 - or a net consisting of wires

or bars - as shown in Fig.37. If the net, due to a large span, hangs too much in, it is useful to bind it at several points to some auxiliary wire 29 placed above the net.

Flexible suspension 25 may be e.g. a piece of rope, a rubber rod, a ball-joint, etc., the vertical bar forming the obstacle, is made of a material with a weight, owing to which it can be deviated by the passing runner without any pain and injury, but it is not so light that it could be deviated to a great extent by small power effects.

For testing the technical skills of football players according to the invention, field sections seen in Figs. 16-27 have been developed. The shaping of each field section is so that the football player to be tested could perform each technical task alone, without a partner. The total of field sections ensures testing of all technical problems and situations, thus a general picture can be obtained about the technical skills of the football player.

In order to let best approach the artificially created technical situations to reality, each field section is covered by lawn. Of course, other coverings used in sport fields may also be applied. Considering that the result of measurements would be falsified if the eventually badly handled ball left the field section, they are surrounded by fence. The simplest fence is a net spanned onto columns high enough for the ball being not able to leave the field section. In another version, field sections may also be covered by a net. In the fence, opposite to each other, holes of a size are cut suitable for football players to run easily through them.

As the basic data in testing the technical skills is the time needed for performing the given tasks on field sections, a time measuring device is an indispensable element of this arrangement. Tasks here are assorted so that they last from

stepping in to leaving, for both individual field sections and the whole arrangement, thus measuring the time elapsed between stepping in and leaving is satisfactory. In a well-constructed arrangement the dead time is relatively small, thus it does not influence the results significantly. Therefore, time may be measured also by a stop watch similarly to the previous arrangement, but in order to increase the accuracy, it is preferable to use some kind of electric sensors coupled to some kind of time measuring devices already mentioned.

The arrangements of individual field sections may be introduced as follows. For sake of lucidity, field sections and tasks to be carried out on them will be described in parallel.

On field section 31 shown in Fig.16, two kick-off sites 38 and two goal sites 39 are marked out. Kick-off site 38 is a straight line, goal site 39 is a point. Painting as used in sport (football) fields marks both. As a target object 40, a plane reflective element 39 is placed at goal site 39, in which reflective element there is a hole of about the size of one and a half times bigger than the football. It is seen from Fig. 16 that both, kick-off sites 38 and goal sites 39 are placed symmetrically, from which fact it follows that in the simplest case, one of each is also enough. Starting point 31i and end point 31v are marked out at the two openings in fence 37 surrounding field section 31.

Field section 31 serves the measurement of the accuracy of passes. The task is the following.

Football player 17 runs through starting point 31i, and runs to any of kick-off sites 38. A ball is placed onto kick-off site 38. Football player 17 should kick the ball to the opposite target object 40. Kick-off site 38 is so far from fence 37 that football player 17 can near to kick-off site 38 from the direction of fence 37. Then he runs to other kick-off site 38 while handling the ball, and then he

kicks it to the opposite target object 40. If he does not succeed in hitting some of target objects 40, he has to repeat kicking until he reaches the appropriate number of hits, in the present case two hits. After performing the task, football player 17 leaves the ball on field section 31, and runs out at end point 31v. The task can be made more difficult so that both goal objects 40 should be hit twice or even more times.

The ideal movement of football player 17 of ideal skill is marked by direction 18 drawn by a dashed line and arrows, whereas the pathway of ball 56 is marked by a dotted line.

Technical performance in this task could also be measured so that we determine how many hits are achieved from a certain number of kicks. However, the measure for the performance according to the invention is the time between passing through starting point 31i and end point 31v. This is more advantageous, since football player 17 is forced to handle the ball during a quick motion. This simulates better the situations during a match.

Another embodiment of field section 31 is shown in Fig. 17. Kick-off sites 38 are shaped as two parallel lines showing along the longitudinal axis of the field, and four goal sites 39 are marked on each of them. Target objects 41 are placed on goal sites 39 identical in their shape to the deflecting elements used in regulating traffic (deflecting cones or buoys).

Football player 17 kicks the ball from the nearest kick-off place to starting point 31i (relative to the longitudinal axis of field section 31) either from the right, or from the left side, to the nearest opposite target object 41, technically from the end of the straight line containing kick-off sites 38 nearest to starting point 31i, then runs to the other straight line containing kick-off sites 38, and from kick-off site 38 lying beside the target object hit previously, he scores

again to the opposite target object 41. Thus, moving in a zigzag line, he should hit all goal objects 41 after one another. Measurement of performance occurs as previously.

In Figure 18. a field section 32 is shown on which, in addition to starting point 32i and end point 32v, a kick-off site 42 is marked out, and its two neighboring corners are provided with reflective elements 43. Kick-off site 43 is a circle of a somewhat larger diameter. Reflective elements 43 are plane boards of vertical position, turned to the internal part of field section 32 with their reflecting surfaces, and the axes 43t of the two reflective elements intersect on their sides towards the internal part of field section 32, preferably in the neighborhood of kick-off site 42, or, even more preferably, they also cross kick-off site 42.

On field section 32 constructed for measuring the accuracy of passing and taking over the ball, the task is the following.

Football player 17 runs to direction 18 through starting point 32i, up to kick-off site 42, and he kicks the ball placed on it to one of reflective elements 43. He takes over the bouncing ball at kick-off site 42, and kicks it with a quarter turn to the other reflective element, then leaving the ball on field section 32, he leaves the field through end point 32v. The measure of performance is here also the time spent between passing starting point 32i and end point 32v, the length of which way is influenced by the necessary motion of football player 17 to acquire the bouncing balls at kick-off site 42, and if he fails at some of the reflective elements, he should repeat kicking. The task can be made more difficult by increasing the number of reflective elements 43, or the number of kicks.

On field section 33 shown in Fig. 19, in addition to starting point 33i and end point 33v, a goal 44 and two reflective elements 45 are to be found. Goal 44 is

a simple goal frame, either of normal size or smaller depending on how large field section 33 is. Reflective elements 45 are plane backboards tilted backwards.

Goal 44 is placed at the side of field section 33, preferably immediately at fence 37, thus a large area is free in front of it, and the ball scored to goal 44 is bounced from fence 37. Reflective elements 45 are situated on both sides of goal 44 so that their axes 45t intersect the axis 44t of goal 44, and the intersection M falls to the inside of field section 33.

This field section 33 is constructed for testing lobbing the ball into goal with the instep, flying kick and heading to goal. The task is the following.

Football player 17 runs into field section 33 with the ball through starting point 33i. Just as he arrives, he makes a lobbing with instep to one of the opposite reflective elements 45. By moving towards the bouncing ball arriving back from reflective element 45, he makes a flying kick into goal 44. The bouncing ball coming back from goal 44 is then kicked again to some of reflective elements 45, and the lobbed ball is headed into goal 44. Heading can be carried out either by kicking up or without it. After performing this task, football player 17 leaves in running through end point 33v. The measure of performance is the time elapsed between passing starting point 33i and end point 33v. The task can be made more difficult by increasing the number of playing at one goal, or so that on the other side of field section 33, another goal 44 and two reflective elements 45 are placed.

On field section 34 shown in Figure 20 in top, and in Fig. 21 in side view, in addition to starting point 34i and end point 34v, three points 47 are marked out on a straight line 46. Above each point 47, a suspended obstacle 26 - already described - is hanged.

Field section 34 is constructed for measuring the capacity for dribbling and ball handling, and the task to be carried out is the following.

Football player 17 runs into the field section through starting point 34i with the ball placed before him, and he has to lead the ball through field section 34 by slaloming, compassing the suspended obstacles 26 to the right and to the left, and runs out with the ball through end point 34v. Evaluation is based on the time needed between passing through starting point 34i and end point 34v. The task can be made more difficult by increasing the number of points 47 and/or decreasing the distance between them.

On field section 35 shown in Fig.22, in addition to starting point 35i and end point 35v, six points 50 are marked out. These are marked out on parallel lines 48 in pairs so that they fall also onto lines 49. Suspended obstacles can also be hanged above points 50, but painting or marking by buoys is also enough.

Field section 35 is constructed for measuring the capacity for dribbling and ball-controlling technique. The task is the following.

Football player 17 runs with the ball placed in front of him through starting point 35i into field section 35, rolls the ball in between the first pair of points 50, while he compasses one of points 50, e.g. that on the left side. By compassing point 50, he runs through between the first and second pair of points 50, while rolling the ball further between the second pair of points 50. After that, he compasses the right one of the second pair of points 50, and runs between the second and third pair of points 50. Finally, he compasses the left one of points 50 in the second pair, and runs out of the field section with the ball through end point 35v. The start in direction 18 is arbitrary, i.e. football player 17 decides whether he starts from left or right. Performance is measured as the time elapsed between passing through starting point 35i and end point 35v.

The task can be made more difficult in several manners.

It can be made more difficult by increasing the number of straight lines 48 (at the same time, that of points 50 as well), and by decreasing the distances between straight lines 48 and/or points 50.

A second possibility is to change the configuration. An example for this is shown in Fig. 23, where the point pairs on straight lines 48 are shifted relative to each other. The formerly mentioned possibilities can be applied here as well.

In Figure 24, the top view of field section 36 with starting point 36i and end point 36v is shown. About in the middle of field section 36, a straight line marks out a kick-off site 51, whereas beside fence 37, a goal 52 is to be found. Goal 52 - similarly to goal 44 - may be a simple goal frame of the size of a normal goal, but in case of a smaller field section 36, it is preferable to apply a smaller one.

The task on field section 36 serving the measurement of scoring ability is the following.

Football player arrives running through starting point 36i to the middle of field section 36, then he kicks the ball placed onto kick-off site 51 with a strong instep through goal 52, and finally, he runs out through end point 36v leaving the ball on field section 36. If the ball misses (fails) goal 52, the task has to be repeated. The basic measure of performance is here also the time elapsed between passing through starting point 36i and end point 36v.

The task on field section 36 can be made more difficult by increasing the number of balls to score.

Taking into account that there are "right-footed" and "left-footed" players, field section 36 can also be arranged so that two kick-off sites 52 are marked out in

the middle, and there are goals 52 on both sides. Player 17 can choose goal 52 corresponding to his physical faculty. In this arrangement the task can be made more difficult by letting football player 17 score to both goals 52.

Goal 52 can also be constructed in the way shown in Figs. 25 and 26 in top and side views. Goal 52 is essentially formed by two columns 25, on which passing-through sensors are mounted above each other in distances smaller than the diameter of the football. These passing-through sensors are photoelectric cells, but other devices, preferably electronic ones may also be applied. The arrangement makes checking the performance easier, as well as in case if it becomes necessary, checking the accuracy of the shot.

On field section 36, a second gate 53 can also be placed between goal 52 and kick-off site 51, close to the latter, which is also provided with passing-through sensors 55. Gate 53 provided with passing-through sensors 55 makes possible to measure, in addition to time spent on field section 23, also the speed of ball when passing through gate 24, from which the shooting force can also be determined.

It is seen from the task that goal 52 and gate 53 are not necessarily of the same size, goal 53 may be smaller. On the other hand, as goal 52, and in given cases gate 53 as well, essentially consist of the plane sensed by passing-through sensors 55, they can be arranged not only in vertical, but also in horizontal rows.

An example for the arrangement for testing technical skills is shown in Fig. 27. The sequence of field sections is 31, 32, 34, 35, 33, 36.

Field sections 31, 32, 34, 35, 33, 36 are surrounded by fence 37, and are separated from each other. Corresponding to the sequence, at starting point 31i, at common starting and end points 31v-32i, 32v-34i, 34v-35i, 35v-33i, 33v-36i there are openings in fence 37, which - similarly to the arrangement shown in

Fig.12 - are provided with sensors 19. Sensors 19 are also in this case photoelectric cells, coupled to an electronic timing device TM.

Timing device TM measures the passing through times separately in each field section 31, 32, 34, 35, 33, 36, and transmits them into a personal computer (PC). The PC sums up the times spent for the tasks on field sections, and the processed data are stored separately for every player, thus they can be immediately compared with previous data. By means of the arrangement, standards of technical skills can be elaborated, thus the incoming data can be compared with them, too.

Individual field sections 31, 32, 34, 35, 33, 36 have been realized by principles shown in Figs. 16-26 as follows.

On field section 31, corresponding to the principle shown in Fig. 17, kick-off sites 38 are formed by two parallel lines, and at the same place, four goal sites 39 are marked out, onto which deflection elements already mentioned are placed as target objects 41. The distance between neighboring goal sites T11 is 5 m.

On field section 32, a kick-off site 42 and, in its four corner, four reflective elements 43 are to be found. The diameter of kick-off site D is 4 m, the distance between kick-off site 42 and reflective elements 43, T12 is 11 m. The width of reflective elements 43 is 3 m, their height is 1.5 m.

On field section 34, eight points 46 are marked out. The distance T13 between neighboring points 46 is 1.5 m.

On field section 35, six straight lines 48 are marked out. Points 50 fall onto the intersections of these lines 48 and the lines 49 perpendicular to them. The dis-

tance T14 of straight lines 48 is 2 m, the distance T15 of points 50 falling onto the same line is 0.5 m. There are deflecting elements placed on points 50.

On field section 33, there are two goals 44 and two reflective elements 45 on each side of both goals. The distance T16 between goal 44 and reflective element 45 beside it is 13 m. The radius R of free area in front of goal 44 is 18 m. The width of goal 44 and reflective elements 45 are 3 m, their height 1.5 m. The task on field section 33 has to be performed with the difference from the description of principal construction that both the scoring series and heading series should be carried out with all of the four reflective elements 45, and always the opposite reflective element 45 relative to the previous one should be used.

On field section 36, two pairs of goal 52 and gate 53 are placed on both sides of the axis determined by starting point 36i and end point 36v. The passing-through sensors 55 on goals 52 and gates 53 are coupled to a speed (velocity?) -sensor VM that transfers the data to the PC. Their processing occurs in a similar way as that of time data. The widths of paired goals 52 and gates 53 are not identical, that of goals 52 is 5 m, whereas that of gates 53 is 2m, their height is the same, 2 m, the distance T17 between them is 9 m. The task is to score to the two pairs of goals 52 and gates 53 several times (three times to each), and after every shot the player should turn to the other goal pair comprising goal 52 and gate 53.

It is obvious from the description that the lengths of either the whole field or of individual field sections are of no significant importance, as the time needed for the performance is hardly influenced by the running speed. The difficulty of tasks is also more preferably increased by increasing the number of tasks and tools placed on the field sections than by increasing their length.

Due to the characteristics of football, the placing of tools and the distances between them have a more important role, but a professional should be capable of choosing from them based on the principal arrangement. This choice will be obviously influenced by the area available, but an aspect to be taken into account may also be e.g. whether the arrangement is designed for testing adults or children. Therefore the following dimensions are only suggested values. Distances T11 and T12: 8 - 16 m; T13 and T14: 0.5 - 2.0 m; T15: 0.3 - 3.0 m; T16: 5-20 m; radius R: 2 -20 m; T17: 5 -20 m. For the width of goal 44: 2.0 - 3.5 m, for its height: 1.0 - 2.0 m can be suggested, for the widths of reflective elements: 2.4 - 7.5 m, for their height: 1.3 - 3.5 m. (The dimension of tools depends on the distances.)

Finally, concerning reflective elements 43 and 45 it should be mentioned that instead of plane backboards, any other surface can be used, and the angle between the axis 45t of reflective element 45 to the axis 44t of goal 44 can also be relatively freely chosen within the given principal conditions.

The arrangement and procedure described up to this point provide extensive, usable information on the technical skill of football players. Appropriate conclusions can be drawn from them concerning eventual insufficiencies. Since for performing the majority of tasks a series of short, appropriate motions is needed, for improving the results, it is worth studying which element of the motion should be improved. By means of the arrangement shown here, eventually by some technical complementation, the individual, special parameters of such technical skills can also be measured.

It is well known that in the majority of football players, the ball handling and scoring capacity is not identical for the right and the left leg, and heading cannot be compared with either. The arrangement provides a possibility also for

evaluating these. All to be done is that on field sections 31, 32, 33 and 36, football player 17 carries out the task once with his right, once with his left leg (using his feet also instead of heading), and on field section 33, scoring to goal 44 only by heading.

Another possibility is offered by the slalom tasks. Supposing that football player 17 has finished the tasks on field sections 34 and 35, and the time result obtained indicates some faults. Slower performing of the task may be attributed to two reasons: faults either in motion, or in ball handling of the player. This can be tested as follows. Football player should perform again the tasks on field sections 34 and 35, but without the ball. The result thus obtained provides information on the slaloming ability of the player. If this time is too long, motion should be improved, if it is appropriate, ball handling technique should be revised.

As it has been mentioned at describing the tasks on field sections 31, 32 or 33, the time spent is influenced also by the motion of football player 17 without the ball, i.e. that how much time is spent for bringing himself or the ball to a suitable position.

The simplest way to establish this is a motion analysis, where the series of motions carried out on field sections 31, 32 or 33 is divided into sections, and the times needed for them are measured separately. The first section lasts always from passing starting points 31i, 32i or 33i to the site where football player 17 kicks the ball first according to the task given, and the last one from the last kick to passing end points 31v, 32v or 33v. The section between the first and last section should be studied differently for field sections 31, 32 or 33.

On field section 31, football player 17 moves without the ball when he runs from one kick-off site 38 to the opposite kick-off site 38, and in the meantime,

he acquires the ball scored previously to target object 40 or 41. Thus, practically the section between the first and last sections of motion can be divided into sections lasting from one kicking of the ball to a repeated kick. Times needed for every section can be measured. It can also be studied, how acquiring the ball influences the time of performance. For this, the task should first be performed without the ball, football player 17 runs touching each kick-off site 38, through field section 31. The difference in time spent with and without the ball provides the time spent for acquiring the ball. This time can also be measured so that we take into account only the time between arrival at target object 40 or 41 and the repeated kick. However, at this solution it should be considered that football player 17 is still on his way towards kick-off site 38, when the ball had already reached target object 40 or 41, thus the player cannot acquire the ball immediately.

On field section 32, analysis of the motion series between the first and last motion may be as follows. According to the task, football player 17 kicks off the ball from kick-off site 42 to one of reflective elements 43, and then kicks the bouncing ball again from kick-off site 42 to the other reflective element 43. Between the two kicks, football player 17 should run to the place where the bounced ball is expected, and should acquire the ball. In an ideal case, ball comes back to the place from where football player 17 kicked it off, and then he can perform a flying shot. It is also a good result, if the ball arrives at any place from where football player 17 can perform either a flying shot, or he can kick it back after a rebound immediately. As the ball should pass the way between kick-off site 42 and reflective element 43 there and back, the time for this part of the task cannot be shortened. If acquiring the ball lasts longer or the ball arriving outside kick-off site 42 should be brought back, the time between the arrival and repeated kick of the ball is a loss. The aim of this test is just to

establish this fault in ball handling or in positioning. One of the sections of motion series between the first and last section is thus a section from the first kicking off the ball to its coming back, another one is from its coming back to its repeated kicking off. In a case of good technical skill, the time of latter could be zero.

On field section 33, time between the first and last section can be divided into sections, in which the ball is principally always in the air, and football player 17 should position himself in a favorable position during this time. Thus the measurement of times between the kicking offs the ball, its arrival to reflective element 45 or goal 44, and its repeated kicking off or heading away is already enough. From the difference in times needed for individual sections it can be established whether football player 17 has moved satisfactorily without the ball on field section 33.

Times necessary for performing the tasks may be measured by a stop watch, though as only very short times are involved, the accuracy of the stop watch or rather that of its operator is questionable. Therefore, preferably more accurate timing possibilities should be applied. For example, a microwave system described earlier - which follows instead of the player, rather the ball- is suitable, or a system consisting of digital cameras placed in an appropriate way, but simpler and cheaper solutions are also known for solving this task.

One of these methods is that beside field sections 31, 32 or 33, a microphone is placed (not shown), which is coupled to a timing device TM not shown. The microphone senses the noise of kicking off, as well as that of the ball arriving at target object 40 or 41, to reflective element 43, and to goal 44 and reflective element 45 (goal 44 should be designed by a hard reflective surface at the back), thus from the signs the time elapsed between kicking and hitting can be

measured, and, in tasks with strictly known distances, even the velocity of the ball can be determined. Considering that the noise caused by rebounding ball would have a disturbing effect, the sensing system should be adjusted so that it senses only the noise caused by kicking and hitting as signs to be taken into account. In this case it is important that materials should cover the ground, e.g. by lawn, on which the noise of a ball falling on it gives a weaker noise, than that of kicking or hitting. (If an electronic timing system is already developed for these measurements, of course, starting points 31i, 32i, 33i and end points 31v, 32v, 33 v can also be provided with sensors 19, which can also be coupled to timing device TM, and this with the PC of the arrangement.)

On field sections 31 and 33, the sign of the microphone indicates in all cases the start and end of the section to be measured, thus processing and evaluation do not pose any problem. However, on field section 32, the microphone did not sense that the ball reflected from the first reflective element 43 falls down, since football player 17 could not kick it away immediately. Therefore in this case, the time needed for coming back of the ball is considered to be equal to that elapsed between kicking off the ball and its hitting reflective element 43.

The first and last sections as interpreted above can be applied also for field section 36, since football player 17 has to run to the middle for performing the task, and after that, he has to leave field section 36 by starting from this point. However, the indirect measurement described above is not necessary here, the sign of sensor 55 belonging to goal 53 indicates the end of first section at the first kick, and the start of last section at the last kick.

It should be emphasized that the measure of testing the technical skill complemented with the above measurements according to the invention, remains the time spent for performing the tasks on individual field sections and the sum of

them. At the same time, from the data originating from these complementary measurements, other measures can be derived e.g. so that only the so-called "real play times" are summarized so that the first and last sections spent on field sections 31, 32, 33 or 36 are left out. "Real play time" can be determined in a more precise way. A combined measure can be developed into which, in addition to the time spent for performing the tasks on individual field sections, the results of these complementary measurements are also built in. No general guide can be given for this, always the particular circumstances necessitating the measurement should be considered. Correspondingly, all evaluation systems including simple summation, weighed summation or point systems can be used.

Attention should be called to a very important principle related to both, the arrangement serving testing of technical skills for football players described above and the development and application of the arrangement serving checking the individual physical parameters of human body.

Though the measure for evaluating the tests is the time needed for passing through the arrangement, this, in itself is not an absolute measure, it makes only comparative relation possible. For example, two football players can be compared with each other, the performance of a football player before and after grounding or the state of a sick human being in different stages of the illness or reconvalescence. However, only performances can be compared measured always on the same arrangement. This means that though the arrangement can be designed from any field sections in any sequence, the arrangement once constructed must not be changed, or a change makes earlier results unusable (useless). Moreover, not only the arrangement, but also tasks must not be changed. If tasks may be changed in a given arrangement, it is worth designing

the arrangement so that the less possible task should be repeated, or if it is necessary, rather the number of tools should be increased. The ball is also to be taken as a tool, since the number of balls placed onto kick-off sites can exclude mistakes just as well as by the number of target objects.

Besides necessity, unchanged arrangements and tasks have another advantage. As the number of test results obtained with different persons or football players increases, after a sufficient amount of test results, a standard scale for the given arrangement and the given branch of sport can be constructed. This makes an absolute evaluation to a certain extent possible. For example, in case of an appropriate arrangement, the results of test for checking individual physical parameters of human body and results of physiological examination can be correlated just like the 12-minute Cooper-test has a physiological equivalent.

The arrangement designed for testing technical skill shows the general grounding of the football player, and from his performances on individual field sections, conclusions can be drawn for the short-comings of a player. Specially designed training fields serve the improvement of faults and grounding.

One of the places of training to be carried out according to the invention is training ground 61 shown in Fig.28 in top view. On training ground 61, a goal 68, four wobbling (teetering) elements 69 and two reflecting elements 70 are placed, above training ground 61, five suspended obstacles 26 are hanged with flexible joints 25 on each of two horizontal holders 24. Figure 29 shows the inside of training ground 61 as is seen from the axis of goal 68.

Goal 68 is to be found at one side of training ground 61. Opposite to it, parallel to straight line 61e crossing it, horizontal holders 24 are placed. Wobbling obstacles 69 stand between goal 68 and suspended obstacles 26.

As reflective elements, any known reflecting element of known material and design can be used, thus the simplest reflecting board of vertical direction is satisfactory. However, from the viewpoint of tasks to be carried out it is preferable if at least their angle to the vertical direction can be varied. Reflective elements 70 stand at both sides of goal 68, their axes 70t intersect the axis 68t of goal 68. Their intersection M1 falls inside of training ground 61.

Training ground 61 is surrounded by fence 71, which may be a simple wire net mounted on simple bars, but nets of more flexible material are also suitable, and the spanning of net may also be flexible. Fence 71 is provided with an opening for passing through, which can be closed by a door of the same design as the fence.

On training ground 61, combined technical-tactical tasks can be practiced. So e.g. taking down and over of the ball, ball technique in different directions, dribbling, scoring capacity (dribbling-scoring, flying shot) can be improved, as well as evaluation and utilization of situations before the goal. Exercise and its effect are the following.

During exercise, football player 17 leads the ball to wobbling obstacles 69 by compassing suspended obstacles 26 in a dribbling way, and scores the ball to goal 68 through elements 69. If the position of wobbling obstacles does not allow scoring, football player 17 has several choices. He either dribbles himself between them, and scores so to goal 68, or hits the ball to some of reflective elements 70, and then he has to score the ball bouncing before or behind obstacles 69 into goal 68. The task can also be given so that reflective elements 70 by all means should be brought in play. (Since on this, and other grounds described later, the position of tools can be varied, suspended obstacles 26 and wobbling obstacles are moving, it is not possible to speak about an ideal run-

ning direction of football player 17 or lead direction of the ball. Therefore, only characteristic situations and movements are indicated in the figure -that of the player by dashed line, that of the ball by dotted line.)

Basic condition for good dribbling is the quick adjustment to changing situations so that football player 17 could pass through obstacles before him. At swinging suspended obstacles 26, he is forced to the quickest processing of information and responding, as otherwise collision disturbs him in carrying out the task, and he is put off of ball technique and dribbling. Football player 17 has to pay attention to suspended elements 26; thus he cannot follow the motion of the ball with his eyes. He should sense the position of the ball by his feet from dribbling. In that way, his attention could be directed to his environment. By means of suspended obstacles 26, the special capacity of being able to lead the ball straight by dribbling through the defending adversary can be developed. This cannot be exercised e.g. by the suspended system mentioned in the introduction.

Processing of excess stimuli before wobbling obstacles 69 impedes the execution of tasks. At most one scoring situation is given due to the motion of wobbling elements 69, and missing this, forces football player 17 to change the character of his motion immediately. This means that processing of information and response action should be much quicker than in traditional training. More difficult and complex situations can be modeled by wobbling elements 69 and suspended obstacles 26 than occurring in reality on a football field.

By the different positions of reflective elements 70, heading to goal and flying shots can be modeled when the ball is coming from different heights from the side of field so that scoring should be performed from the area before or behind wobbling obstacles 69.

Training grounds according to the invention can be developed also for exercising a series of tasks comprising less tasks.

On training ground 62 shown in Fig. 30, a goal 68, and above ground 62, five suspended obstacles 26 are hanged on each of two parallel horizontal holders 24. Goal 68 is situated on one side of training ground 62. Horizontal holders 24 are parallel to straight line 68e passing through goal 68. Training ground 62 is also surrounded with fence 71, in front of which reflective elements 72 may be placed on both sides of goal 68.

Training ground 62 is suitable for exercising dribbling, taking over the ball by dribbling, and dribbling-scoring. The exercise and its effect are the following:

Football player 17 leads the ball towards goal 68 so that meanwhile he compasses swinging suspended obstacles 26 by dribbling motion, then after leaving them, he shoots ahead and scores to goal 68.

On training ground 63 shown in Fig.31, one goal 68 and four wobbling obstacles 69 are placed, whereas above training ground 63, five suspended obstacles are hanged on each of two horizontal holders 24.

Goal 68 is situated on one side of training ground 62, wobbling obstacles are placed to the foreground. Horizontal holders 24 are parallel to straight line 68e passing through goal 68. Training ground 62 is also surrounded by fence 71.

Training ground 62 is developed for increasing the capacity for ball leading to different directions, dribbling, scoring and evaluation and processing of situations before the goal. The exercise and its effect are as follows:

In course of the exercise, football player 17 leads the ball to moving wobbling obstacles 69, between suspended obstacles 26, by dribbling, and scores the ball to goal 68 between them. If the position of wobbling obstacles does not

allow scoring, football player dribbles himself through them and then scores to goal 68.

As to the number of tools placed on training fields 61, 62, 63, following should be mentioned.

It is clear from the description that the tool set provided in the embodiments is determined by supposing one goal 68 in each case. Later on, when describing the complete arrangement, it shall be seen that by placing more goals 68, simultaneously more players can exercise. Naturally, to more goals 68 more tools are needed.

In principle, the number of wobbling obstacles 69, reflective elements 70 and suspended elements 26 belonging to one goal 68 can also be freely increased, and by increasing this number, the difficulty of the task and the variability of simulated situations also increases. However, it should also be taken into consideration that the adversary has only 10 fielders, thus in the match to be modeled, also only several players participate. The number of tools is restricted also by the area available.

At the same time, a too small number of tools narrows down the possibilities, and makes the tasks too simple. Therefore - only as a suggestion - it may be said that for one goal 68 preferably at least two horizontal holders 24 with at least four suspended elements 26 on each, and on ground sections 61 and 63 at least four wobbling obstacles 69, whereas on ground section 61 at least two reflective elements 70 should be placed.

When applying two horizontal holders 24, it is preferable to place them parallel to each other, as these arrangement models best the adversaries tackling the player. Horizontal holders 24 may be placed in other direction as parallel to the axis 68t of goal 68, but this is not really necessary. The task is the same, only

the angle from which scoring occurs is different. In modeled situations this is of no importance. The arrangement parallel to axis 68t is universal, because place is best utilized this way, thus this placement is preferable.

On training ground 64 shown in Fig. 32, one goal 68 and one reflective element 73 on its each sides, are to be found.

Reflective elements 73 are also of plane surface, and they can be adjusted and fixed in positions deviating from the vertical direction. Their axes 73t intersect the axis 68t of goal 68, their intersection M2 falls inside of training ground 64. Training ground 64 is also surrounded by fence 71.

On training field 64, the capacity for flying shot, heading, utilization of balls arriving to the goal from the side can be developed. Exercise and its effect are as follows.

Running football player 17 kicks the ball to reflective element 73, and forwards the ball arriving back from it by heading or kicking into goal 68.

The effect of this exercise is that if player 17 makes a mistake in lobbing the ball to reflective element 73, he is incapable of scoring by head or leg. In order to avoid this, he develops the suitable action pattern quicker. As the tilting angle of reflective element 73 can be varied, football player 17 exercises all kinds of kicking and heading from the flying shot of a ball arriving in a flat lob to heading a ball arriving in a high lob.

As is seen from the description, reflective elements 73 and similarly, reflective elements 70 on training ground 61 are placed on both sides of goal 68 so that their axes 73t and 70t intersect the axis 68t of goal 68 in the inside of training grounds 64 and 61. This is dictated by expedience originating from the tasks to be practiced, since the aim is that the ball kicked to them gets back into the

neighborhood of football player 17. The farther M1 and M2 intersections from goal 68 are the smaller the possibility for the ball to arrive in the foreground of goal 68. Though tasks can be modeled also to such arrangements, e.g. when football player 17 should handle a ball from a position corresponding to the side of the ground, but these extreme situations can be solved also by reflective elements 70 or 73 closing in a smaller angle with the plane of goal 68, thus M1 and M2 are preferably placed in the manner shown.

On training ground 65 shown in Fig. 33, one goal 68 and one reflective element 74 is situated.

Goal 68 is placed to the side of training ground 65. Reflective element 74 which will be discussed later in more detail, has two vertical holders on its two sides, and a plane board which can be fixed at different heights. Reflective element 74 is placed in the foreground of goal 68. Training ground 65 is also surrounded by fence 71. It will be seen from the technique of exercises that on training field 65 is preferable if in front of fence 71, before goal 68, two reflective elements 72 are also placed.

On training ground 65, skill in taking over the ball, in scoring, the efficiency of shot, and staying power (fitness) can be developed. The exercise and its effect are as follows.

Football player 17 has to kick the ball immediately or after taking it over flatly, lobbed, chopped or screwed - depending on the height under the lower edge of the plane board of reflective element 74 - into goal 68. Football player 17 performs the task alone, if fence 71 is rigid enough or there are reflective elements 72.

Faulty execution creates immediately a new situation to be react to, as the bouncing ball arriving back from reflective element 74 should be kicked again

to goal 68. The task can be made more difficult if reflective element 74 is not only adjustable in height, but can also be tilted.

On training ground 66 shown in Fig. 34, only one goal is placed. The specialty of this ground is that it is covered by grained material 75, in this case sand. Training ground 66 is also surrounded by fence 71.

Training ground 66 serves to improve the conditions for a successful execution of football technique, (dynamic force of leg muscles and the staying power of local musculature), to create and exercise conditions decisively necessary for successful fighting. Exercise and its effect are as follows.

On training ground 66, one-against-one or two-against-two type games are played, in which also the goalkeeper takes part. The task is scoring to goal after ball dribbling or acquiring a bouncing ball.

The sandy ground makes moving more difficult, and requires high technique in ball handling. Thus, it is particularly useful for the coordination of muscle movements, and in creating conditions for the dynamics and staying power of movements. Grained material 75 may also be other material than sand (chemically SiO_2).

From exercises carried out on training grounds 61, 62, 63, 64, 65 and 66 it is seen that it may be of advantage, if the ball bounces back hardly from the bottom of fence 71 as it helps in keeping exercising continuous. Balls bouncing hardly from the top of fence 71 may fall too far from football player 17, and this may break the course of exercising. Therefore, fence 71 is preferably developed so that it consists of a net of flexible material, or it is spanned flexibly, and reflective elements 72 are planted to the foot of fence 71. Training grounds 61, 62, 63, 64, 65 or 66 may be surrounded fully by reflective elements 72, but,

in some cases, it is enough to place them at certain sections of fence 71, as is shown in Figs.30 and 33.

As is seen in Figure 35 in top, in Fig. 36 in side view, no tool is placed on training ground 67 at all, but the material of fence 76 is a flexible net hanged onto holders 77 with flexible elements 78. Holders 77 in this case are columns standing outside fence 76, and bend above fence 76 as gallows trees.

Training ground 67 is developed for training and exercising different kinds of kicks and for a particular development of staying power.

The exercise consists of scoring the ball by football player 17 with different forces and to different directions by different kinds of kicks to flexible fence 76.

The form of fence 76 ensures continuous exercising, as the ball arrives back always softly before football player 17, thus he can kick the ball continuously without setting it.

It can be seen from the version of exercise that only one requirement concerns the development of fence 76, that it should form a soft boundary around training ground 67 without any rigid element (e.g. column). Consequently, each technical solution placed outside the surface of fence 76 is suitable as holder 77, e.g. wires spanned out above fence 76 in a certain distance, with holder columns outside fence 76. (If necessary, holding elements of wire 77 can also be applied bound with auxiliary wires 29 similarly to the solution shown in Fig.29.) Another suitable solution may be that fence 76 made of a soft material is wider when spread out than the height between its upper edge and the ground, thus it hangs loosely in. It may be another suitable solution that the lower edge of fence 76 made of a soft material is not fixed (this is suitable

rather for nets made of a heavier material). Flexible joints can be avoided in both cases.

The detailed description should be complemented with some general notes.

Since the aim of exercising is preparation for situations occurring during matches, it is preferable if the conditions on the training ground simulate those on regular football fields. Therefore, in each case, except for training ground 66 covered by sand, the ground is covered by lawn. This is not a necessity, artificial lawn, a mixture of earth and sawdust, and other covering materials used on sport fields can be applied.

For the same reason, it is also preferred when the size of goal 68 is the same as that of standard goals. However, also smaller goals can be used, mainly if only a smaller area is available.

A possible arrangement according to the invention for improving the technical skills of football players is shown in Fig. 37.

Training grounds 61, 62, 63, 64, 65 and 66 are built beside each other and surrounded by fence 71, but they are also separated from each other. Training ground 67 is also included in the arrangement, but due to its development, it is not surrounded by fence 71. On the inside of fence 71, reflective elements 72 forming a continuous surface are placed, whose height MV is 1.5 m.

Individual training grounds are built according to the principles of the invention as follows.

Training ground 61 is rectangular. At each of its two shorter sides, one goal 68 is placed. There are further eight wobbling obstacles 69 and six reflective elements 70. Reflective elements 70 can be rotated around their horizontal axis. Above training ground 61, horizontal holders 24 are arranged in a web-form,

on which holders twenty suspended obstacles 26 are hanged. Positioning of wobbling obstacles 69, reflective elements 70 and suspended obstacles 26 is arbitrary, thus they can be placed half and half in front of the two goals 68, but in modeling special situations, they can all be placed before one of goals 68. Length L7 of training ground 61 is 50 m, L8 is 25 m.

There are four goal sites 68 on training ground 62, one on its each side. Thirty-six suspended obstacles 26 are hanged in arbitrary positions on the horizontal holders 24 arranged in a web-form. Lengths L9 and L10 of training ground 62 are both 25 m.

Training ground 63 is also rectangular. On each of its two shorter sides one goal site 68 is to be found, and eight wobbling obstacles 69 are also placed on it. Horizontal holders 24 above training ground 63 are also arranged in a web-like manner, and twenty suspended obstacles 26 are hanged on them. Positioning of wobbling obstacles 69 and suspended obstacles 26 is also arbitrary, they can be divided in front of the two goals, and - in the way already mentioned - they can also be grouped together before one of the goals. Lengths L11 of training ground 63 is 50 m, whereas L12 is 25 m.

For each of training grounds 61, 62 and 63 is characteristic that the distance T18 between the two external horizontal holders 24 towards goal 68 is larger than the width SK of goal 68. In the present case, distance T18 is 8 m, width SK is 7.32 m (it is a regular goal, thus its height MK is 2.34 m). Distance T19 between horizontal holders is 1.0 m.

Width of reflective elements 70 is 5.0 m, their height is 2.0 m.

On training ground 64, two goals 68 are opposite to each other with a reflective element 73 on their both sides. Length L13 of training ground 64 is 20 m,

its length L14 is 25 m. The width of reflective elements 73 is 5.0 m, their height is 2.0 m.

Training ground 65 is provided with four goals 68, one on its each side. One reflective element 74 is placed in front of each goal. Both lengths of training ground 65 L15 and L16 are 25 m. The width of reflective elements is 5.0 m, their height 2.0 m, largest height of their lower edge is 2.5 m.

On training ground 66, two goals 68 are placed opposite to each other. Length L17 of training ground 66 is 20 m that of L18 is 25 m.

Training ground 67, corresponding to principles, is empty, its both lengths L19 and L20 are 10 m.

Based on the exercises to be carried out on individual training grounds, no rules should be given for their size. Professionals dealing with football can routinely develop training grounds for individual exercises provided with tools of sufficient number. Thus, for dimensions, the intervals given are only suggested values. Lengths L7 and L11: 40-75 m; lengths L8, L9, L10, L12, L13, L14, L15, L16, L17, L18: 20-40 m; lengths L19 and L20: 8-15 m; width SK: 2.0-7.5 m; height MK: 1.0-2.5 m; Height MV: 1.0-1.5 m; distance T19: 0.3-1.0 m; Width of reflective elements 70 and 73 and that of board of reflective element 74: 2.4-7.5 m; their height: 1.3-3.5 m.

It should be emphasized again that tools on training grounds can be repositioned, adjusted or their number can be increased. This is important, as a basic condition for exercising successfully is that technical problems should be solved in different local situations. Efficiency of practice can be increased also by arranging simultaneously more situations on one training ground.

It is also seen from Fig.37 illustrating the arrangement that the individual training grounds can be substituted by each other. Thus, e.g. on training ground 61 exercises suggested for training grounds 62 and 63 can also be performed, only reflective elements 70 or wobbling obstacles 69 should be taken away, and more suspended obstacles 26 should be hanged. Moreover, training ground 61 can also be designed so that one of its shorter sides is arranged corresponding to training ground 63, whereas its two longer sides can be transformed into training ground 62 by placing two further goals 68. Similarly, training grounds 64 and 65 can also be drawn together.

The arrangements according to the invention offer a possibility for the players to carry out the exercises without hindering each other. However, if lack of place or finances restrict professionals, the invention can be realized by a smaller number of training grounds as well, in the same quality, but with the disadvantage that time to be spent on the exercises is shorter.

A further conclusion which can be drawn from the description is that with the arrangement according to the invention, tasks and situations can be modeled meaning very complex but appropriate stimulus for the football player. Numerous versions of situations can be simulated on the training grounds by using suitable tools, thus after a sufficient number of practices, the football player acquires the most suitable motion patterns for reacting to different situations.

The structure of reflective element 74 applied on training ground 65, or at least one of its versions is shown in Figures 38 and 39.

Reflective element 74 has a plane, reflective plate 79, which is a flat board. Reflecting plate 79 is placed on two, vertically placed holding arms 80 at its two vertical sides. Holding arms 80 are constructed of two parallel laths each so that they form a vertical slit, and they are built onto parallel sockets 81.

Between these sockets 81, connecting bars 82 are placed. In both holding arms 80, bores 83 of identical scale are made, into one of them a fixing drift 84 is plugged. Reflective board 79 is placed into slits of holding arm 80 so that its lower end lies on fixing drift 84.

Reflective element 74 shown functions as follows.

Height MT of holding arms 80 is significantly larger than the height ML of reflective board 79, thus reflective board 79 can be moved up and down in holding arms 80. By elevating reflective board 79 to a sufficient height to the exercise, fixing drifts 84 can be plugged into the appropriate bore 83. Thus the height of reflective board 79 can be adjusted. The extent to which requirements for adjustability can be satisfied are determined by the distance between bores 83.

In figure 40, a reflective element 74 is shown on which the height of reflective board 79 can be adjusted continuously, without grades. Sockets 81 and connecting bars 82 of reflective element 74 are tubes fixed to each other e.g. by welding. Holding arms 80 are also tubes. Their lower sides are embedded into sockets 81 by joints (hinges) 85 so that the arrangement can rotate. On each of holding arms 80, one slide (runner) 86 and one fixing element 84 developed as a clamp are mounted. Reflective board 79 is fixed at its two vertical sides to slides 86 and fixing elements 84. Each of sockets 81 is also provided with a clamp 87. Fixing elements (clamp) 87 and holding arms 80 are connected with a swing-bar 88 provided also with joints on its both sides.

Reflective element 74 shown can be adjusted vertically and tilted, as well. By releasing fixing element 84, reflective board 79 can be shifted on holding arms 80 into the desired position. After adjusting, fixing element 84 is to be fixed again. After releasing fixing elements 87, holding arms 80 can be rotated

around a joint of horizontal axis 85, and after reaching the angle position desired, fixing elements can be fixed again in the new position.

Reflective element 74 illustrated in Fig. 41 can also be adjusted vertically and tilted.

Onto each of holding arms 80 fixed rigidly to sockets 81, a fixing element (clamp) 84 and a slide 86 are mounted. Each of the vertical edges of reflective element 74 are connected to fixing elements 84 by joints 85 of horizontal axes on their upper part, and on their lower part, also by joints, to swing-bars 89. Swing-bars 89 are placed into clamp-like fixing elements developed on slides 86.

This reflective element 74 should be adjusted as follows.

Slide 86 can freely move on holding arms 80, thus after releasing fixing element 84, reflective element 79 can be shifted freely independently whether it is vertically positioned or tilted, and can be fixed in the desired height by fixing elements 84. In order to adjust the tilting angle, fixing element 90 should be released. After that, swing-bars 89 can be shifted, and with them, reflective element 79 can be rotated around joint 85 of horizontal axis, then can be fixed again in the position desired by fixing elements 90.

These two forms are universal reflective elements. Their structure ensures the vertical adjustment and tilting of the reflective board. At the same time, any known structure can be used as reflective element. Thus, in addition to plane boards, nets spanned on frames, and boards consisting of arched plates or more plates or nets can also be used, independently of their curvature.

Finally, it should be mentioned that though the invention is discussed on the basis of concrete embodiments, it is obviously not restricted to those. Different

specific names and designations are only used owing to their general and descriptive nature, and not for restrictions. It is obvious that professionals, especially on the basis of the detailed explanations provided, can develop numerous versions and modifications of the methods and arrangements without leaving the broadest area and spirit of the invention. It should also be pointed out that when the previous description mentions procedure steps, elements or tools having equivalent variants, the invention includes also these variants. Correspondingly, the scope of protection for the invention is defined exclusively by the claims enclosed, and every variant, modification, development, equivalent or their combination belong to the scope of protection for the invention determined by claims.

CLAIMS

1. Arrangement for testing the characteristics of the physical condition of human body, mainly those of sportsmen on a flat area combined of at least two field sections, **characterized in** that it comprises at least field sections chosen from among: field section of sprint task (1), field section of jump task (2), field section of plain slalom (3), field section of broad slalom (4), field section of sidling slalom (5) and field section of back sprint task (6), where every field section (1, 2, 3, 4, 5, 6) has a staring point (1i, 2i, 3i, 4i, 5i, 6i) and an end point (1v, 2v, 3v, 4v, 5v, 6v), and in addition

- on field section of simple slalom (3) at least three further points (9) are marked out on straight line (8),

- on field section of broad slalom (4) at least three further points (11) are marked out on both sides of straight line (10),

- on field section of sidling slalom (5) at least three points (13) are marked out on two straight-line sections (12) intersecting each other in a certain angle so that one point (13) falls to the intersection of line sections (12), further points (13) are distributed on line sections (12),

- on field section of back sprint (6) at least two points (16) are marked out on two parallel straight lines (14, 15), and

- field sections (1, 2, 3, 4, 5, 6) constituting the arrangement are di-rectly connected to each other so that the end point (1v, 2v, 3v, 4v, 5v, 6v) of one field section (1, 2, 3, 4, 5, 6) is simultaneously the starting point (1i, 2i, 3i, 4i, 5i, 6i) of the next field section (1, 2, 3, 4, 5, 6), i.e. they coincide, and finally

- the arrangement comprises a timing device (TM) in a manner known at their starting points(1i, 2i, 3i, 4i, 5i, 6i) and end points (1v, 2v, 3v, 4v, 5v, 6v).

2. Arrangement according to claim 1 **characterized in** that starting points (1i, 2i, 3i, 4i, 5i, 6i) and end points (1v, 2v, 3v, 4v, 5v, 6v) are provided with electric sensors (9), which, in turn, are coupled to electric time measuring devices (TM).

3. Arrangements according to claims 1 or 2 **characterized in** that on field section of sprint task (1), between its starting point (1i) and end point (1v), at least one further point (20) is marked out on the straight line determined by them.

4. Arrangement according to any of claims 1-4 **characterized in** that on field section of sprint task (1) the distance (T8) between point (20) marked out on the line between starting point (1i) and end point (1v), and the end point (1v) is at least as long, as the length of deceleration section calculated from the whole length (L1) of field section (1) and the acceleration and deceleration of the persons to be tested.

5. Arrangement according to any of claims 1-4 **characterized in** that on field section of sprint task (1), in addition to point (20) marked out between the starting point (1i) and end point (1v) on the line determined by them, another measuring point (21) is marked out.

6. Arrangement according to any of claims 1-5 **characterized in** that one or more (20, 21) measuring points on field section of sprint task (1) are provided with electric sensor (19), which, in turn, is coupled to electric time measuring device (TM).

7. Arrangement according to any of claims 1-6 **characterized in** that on field section of sidling slalom (5), straight-line sections (12) are connected in a W-shape, and points (13) are marked out lying on them and in their intersections, as well.

8. Arrangement according to any of claims 1-7 **characterized in** that on field section of sidling slalom (5), at points marked out in the intersections of straight-line sections and at its end points (12) are provided with electric sensors (19), which, in turn, are coupled to electric time measuring devices (TM).

9. Arrangement according to any of claims 1-8 **characterized in** that on field section of back-sprint (6), points marked out (16) are provided with electric sensors (19), which, in turn, are coupled to electric time measuring device (TM).

10. Arrangement according to any of claims 1-9 **characterized in** that on field section of back sprint task (6) points marked out (16) on straight lines (14, 15) are provided with one single sensor (19) whose influence line coincides with straight line (14, 15), which, in turn, is coupled to an electric time measuring device (TM).

11. Arrangement according to any of claims 1-10 **characterized in** that on field section of jump task (2) a leap (7) is placed, which can be pushed over and knocked down preferably at least in one direction without hindrance.

12. Arrangement according to any of claims 1-11 **characterized in** that on field section of jump task (2) more leaps (7) are placed, and they are arranged parallel to each other, in one row.

13. Arrangement according to any of claims 1-12 **characterized in** that on field section of jump task (2), leaps (7) are arranged in two rows.

14. Arrangement according to any of claims 1-13 **characterized in** that on field section of jump task (2) a leap of adjustable height (7) is placed.

15. Arrangement according to any of claims 1-14 **characterized in** that on field section of jump task (2) in the neighborhood of the site marked out for

performing the task, an electric sensor (19) is placed, which, in turn, is coupled to time measuring device (TM).

16. Arrangement according to any of claims 1-14 **characterized in** that on field section of jump task (2) at least one electric sensor (19) is placed to the neighborhood of starting point (2i) and end point (2v) coupled to electric time measuring device (TM).

17. Arrangement according to any of claims 1-10 **characterized in** that on field section of jump task (2), dynamometer plateau (22) and/or device for measuring the rise in the center of gravity (23) is placed.

18. Arrangement according to any of claims 1-17 **characterized in** that points (9, 11, 13, 16) are marked by painting.

19. Arrangement according to any of claims 1-17 **characterized in** that points (9, 11, 13, 16) are marked by deflecting elements, preferably by deflecting cones.

20. Arrangement according to any of claims 1-17 **characterized in** that points (9, 11, 13, 16) are marked by suspended obstacles (26) hanged on flexible suspension tackles (25) above them.

21. Procedure for testing the characteristics of physical condition of human body, but mainly those of sportsmen, in the course of which the person to be tested is subjected to kinetic load on flat field sections, where the movement is **characterized in** that at least two steps from the procedure steps are chosen, in which

- in one step, the person to be tested is loaded by plain running on field section of sprint task (1),

- in one step, the person to be tested is loaded by jumping with both feet

on field section of jump task (2),

- in one step, on field section of plain slalom (3), the person is tested by passing alternately at least three points (9) lying on straight line (8) by slaloming in a posture identical with the momentary running direction,

- in one step, on field section of broad slalom (4), the person to be tested should compass with a slaloming motion at least three points (11) lying on both sides of straight line (10) from the opposite side of the straight line in a posture identical with the momentary running direction,

- in one step, on field section of sidling slalom (5), the person to be tested should compass at least three points (13) marked out at the intersections of at least two intersecting straight-line sections (12) and at their ends, from a direction opposite to other points (13) by slaloming in a si-dling posture independently of the momentary direction of running, and finally

- in one step, on field section of back sprint task (6), the person to be tested should run backwards either between two points (16) marked out on two parallel lines (14, 15), or compass the points from the opposite side to the point (16) lying on the other parallel line (14, 15),

- the time spent by the person to be tested in each chosen step on field sections (1, 2, 3, 4, 5, 6) between starting points (1i, 2i, 3i, 4i, 5i, 6i) and end points (1v, 2v, 3v, 4v, 5v, 6v) is measured,

- the whole time spent on field sections (1, 2, 3, 4, 5, 6) together for the chosen steps is also measured.

22. Procedure according to claim 21 **characterized in** that on field section of sprint task (1), the time spent by the person to be tested is determined between starting point (1i) and one or more points (20, 21) marked out between starting point (1i) and end point (1v).

23. Procedure according to claims 21 or 22 **characterized in** that on field section of sidling slalom (5), times spent by the person to be tested is determined at every end of straight-line sections (12) and at intersections (13) with their neighboring straight-line sections (12).

24. Procedure according to claims 21-23 **characterized in** that on field section of back sprint task (6), times are determined between every subsequent point (16) marked out on parallel lines (14, 15) and touched by the person to be tested.

25. Procedure according to claims 21-24 **characterized in** that on field section of sidling slalom (5), the person to be tested is loaded by slaloming in a sidling posture the direction of which is constant and independent of the momentary direction of motion, passing at least two crossing straight-line sections (12) and compassing points at their intersections, at their ends and points between those (13); compassing points (13) at the end of each straight-line sections (12) from the opposite side relative to other points , whereas other points (13) alternately.

26. Procedure according to claims 21-25 **characterized in** that on field section of jump task (2), the person to be tested is loaded by jumping forward through the field with both feet from starting point 2i up to end point 2v.

27. Procedure according to claims 21-25 **characterized in** that on field section of jump task (2), the person to be tested is loaded by sidling jumps with both feet between the neighborhood of starting point (2i) and end point (2v) moving forward and to the right and to the left.

28. Procedure according to claims 21-27 **characterized in** that on field section of jump task (2), the person to be tested is loaded by moving forward by

jumping through leaps which can preferably be easily pushed over and knocked down in at least one direction.

29. Procedure according to any of claims 21-25 **characterized in** that on field section of jump task (2), the leg strength of the person to be tested is measured in the moment of take-off by a dynamometer plateau (22).

30. Procedure according to any of claims 21-25 or 29 **characterized in** that on field section of jump task (2), with a device for measuring the rise in the center of gravity (23), the difference between the height of center of gravity in standing position and in position during take-off with both feet for the person to be tested is measured.

31. Arrangement for testing the technical skill of football players in which a plane reflective element (43, 45), and/or goal (44, 52), and/or suspended obstacle (26), and/or electric passing-through sensor (19) are applied **characterized in** that

- it comprises field sections(31, 32, 33, 34, 35, 36) of different tasks having starting points (31i, 32i, 33i, 34i, 35i, 36i) and end points (31v, 32v, 33v, 34v, 35v, 36v), and

- individual field sections (31, 32, 33, 34, 35, 36) are connected directly so that the end points (31v, 32v, 33v, 34v, 35v, 36v) of one field section coincide with the starting points (31i, 32i, 33i, 34i, 35i, 36i) of the next one ,

- every field section (31, 32, 33, 34, 35, 36) is surrounded by fence (37) on which openings are to be found at their starting points (31i, 32i, 33i, 34i, 35i, 36i) and end points (31v, 32v, 33v, 34v, 35v, 36v) for letting football player pass unhindered,

- the arrangement involves time measuring device (TM) measuring the time spent between passing through starting points (31i, 32i, 33i, 34i, 35i, 36i)

and end points (31v, 32v, 33v, 34v, 35v, 36v), and

- field sections are chosen at least partly from among field sections (31, 32, 33, 34, 35, 36) , where

- on field section (31) at least one kick-off site (38) and one goal site (39) is marked out, and a target object (40, 41) is placed on goal site (39),

- on field section (32) a kick-off site (42) is marked out, and at least two reflective planes (43) are planted so that their axes (43t) cross each other on their side towards the kick-off site (42), preferably close to kick-off site (42),

- on field section (33) at least one goal site (44) and on each of its both side one reflective element (45) is placed so that their axes (45t) intersect the axis of goal (44t), and intersections (M) fall to the internal side of field section (33) relative to goal (44),

- on field section (34) at least three points (47) are marked out on a straight line (46) by suspended elements (26) hanged above them, where suspended obstacles (26) are vertical bars,

- on field section (35) at least three parallel lines (48) are marked out with two points (50) on each, and finally

- on field section (36) at least one kick-off site (51) and one goal (52) is marked out.

32. Arrangement according to claim 31 **characterized in** that starting points (31i, 32i, 33i, 34i, 35i, 36i) and end points (31v, 32v, 33v, 34v, 35v, 36v) are provided with electric sensors (19), preferably with photoelectric cells, which are coupled to time measuring devices (TM).

33. Arrangement according to claims 31 or 32 **characterized in** that on field section (31) comprising kick-off site (38) and goal site (39), there are more

kick-off sites (38) and goal sites (39) marked out so that a given goal site (39) is near to the kick-off site (38) of another goal site (39).

34. Arrangement according to any of claims 31-33 **characterized in** that on field section (31) comprising kick-off site (38) and goal (39), on each of two parallel lines at least two goal sites (49) are marked out.

35. Arrangement according to any of claims 31-34 **characterized in** that target objects (41) placed on goal site (39) are known deflective elements, preferably deflecting cones.

36. Arrangement according to any of claims 31-34 **characterized in** that target object (41) placed on goal site (39) has a hole one and a half-two-times bigger than the football.

37. Arrangement according to any of claims 31-35 **characterized in** that on field section (35) comprising two points (50) on each of parallel lines (48), points (50) are marked out in the intersection of parallel lines (48) and two straight lines perpendicular to them (49).

38. Arrangement according to any of claims 31-37 **characterized in** that on field section (36) comprising kick-off site (51) and goal (52), goal (52) consists of a series of electric pass-through sensor (55).

39. Arrangement according to any of claims 31-38 **characterized in** that on field section (36) provided with kick-off site (51) and goal (52), a further gate (53) consisting of a series of sensors (55) is developed between kick-off site (51) and the goal (52) consisting also of pass-through sensors (55).

40. Arrangement according to any of claims 31-34 **characterized in** that field section (31) comprising kick-off site (38) and target object (40, 41), and/or field section (32) provided with kick-off site (42) and reflective element

(43), and/or field section (33) comprising reflective element (45) and goal (44) is provided with a sensor sensing at least the end point of the movement of ball, which is coupled to a time measuring device.

41. Arrangement according to any of claims 31-34 or 38 **characterized in** that the device sensing the end points of the ball's motion is a microphone.

42. Procedure for testing the technical skill of football players **characterized in** that at least two steps are chosen from those in which

- in one step, on field section (31) on which at least one kick-off site (38) and at least one goal (39) are marked out, and onto goal site (39) a target object (40, 41) is placed, the football player (17) is let to kick the ball from kick-off site (38) to target object (40, 41), and the time elapsing until performing a desired number of successful kicks - hitting the target object -is measured,

- in one step, on field section (32) comprising one kick-off site (42) and two reflective elements (43) the axes (43t) of which intersect each other on their side towards the kick-off site (42), preferably close to kick-off site (42), football player (17) should kick the ball from kick-off site (42) onto one of reflective elements (43), take over the bouncing ball and kick it onto the other reflective element (43) , and the time spent until a desired number of successful kicks on field section (32) is measured,

- in one step, on field section (33) on which at least one goal (44) is marked out with a reflective element (43) on its both sides the axes (43t) of which intersect the axis (44t) of goal (44) on the internal section of the field (33), football player (17) should lob the ball with instep onto one of reflective elements (45), then running towards the goal (44) kick the bouncing ball into goal (44), then kick the bouncing ball onto any of reflective elements (45), and

head the arched (lobbed) ball again into goal (44), while measuring the time spent on field section (33) for a desired number of successful scoring and heading the ball into goal (44),

- in one step, on field section (34) comprising at least three points (47) marked out on a straight line (46) by suspended obstacles (26), football player 17 should lead the ball by slaloming and compassing obstacles (26) from the right and from the left, and the time spent on field section (34) is measured,

- in one step, on field section (35) on which on each of at least three parallel lines (48) two points (50) are marked out, football player (17) should compass points (50) from outside, slaloming lead the ball between points (50), and the time spent on field section (35) is measured, and fi-nally

- in one step, on field section (36) on which at least one kick-off site (51) and one goal (52) are placed, football player (17) should kick the ball from kick-off site (51) into goal (52), and the time spent for a certain number of successful kicks - passing through goal 52 - is measured,

- then the whole time spent on chosen field sections (31, 32, 33, 34, 35, 36) together is determined.

43. Procedure according to claim 42 **characterized in** that on field section (34) on which at least three points (47) are marked out on a straight line (46) by suspended obstacles (26), football player (17) is let once lead the ball slaloming by compassing suspended obstacles (26) from the right and from the left, and once without the ball, running in slalom by compassing suspended obstacles (26) from the right an from the left, and the time spent on field section (34) is measured.

44. Procedure according to claims 42 or 43 **characterized in** that on the field section (35) on which on each of at least three parallel lines (48) two points (50) are marked out , football player (17) is let lead the ball between points (50) in slalom run by compassing points (50) from outside, then running in slalom without the ball, compass points (50) from outside, and the time spent on field section (50) is measured in both cases.

45. Procedure according to any of claims 42-44 **characterized in** that on the field section (31) provided with kick-off site (38) and target object (40, 41), times elapsing between subsequent kicks from kick-off site (38) are measured.

46. Procedure according to any of claims 42-45 **characterized in** that on the field section (31) provided with kick-off site (38) and target object (40, 41), times elapsing between scoring the ball from kick-off site (38) and its arrival at target objects (40, 41) are measured separately as well as the time between the arrival of ball at target object (40, 41) and repeated scoring is measured.

47. Procedure according to any of claims 42-46 **characterized in** that on field section (32) provided with kick-off site (42) and reflective element (43), the time between subsequent kicks from kick-off site (42) is measured separately, and also the time elapsed between subsequent kicks from kick-off site (42) and the arrival of the ball at reflective element (43) at least until the last kicking off the ball is determined.

48. Procedure according to any of claims 42-47 **characterized in** that on field section (33) provided with reflective element (43) and goal (44), times are measured separately between scoring or heading of the ball and its arrival at reflective element (43) or into goal (44), as well as that between the arrival of the ball from reflective element (43) or goal (44) and its repeated scoring or heading.

49. Procedure according to any of claims 42-48 **characterized in** that on field section (36) provided with at least one kick-off site (51) and with at least one goal (52) formed by a series of electric passing-through sensors (55), the passing of the ball through goal (52) is checked, and the time elapsed between the kicking off the ball and its passing through goal (52) is measured.

50. Procedure according to any of claims 42-48 **characterized in** that on field section (36) provided with a gate formed by electric passing-through sensors (55) and a goal (52), the football player (17) is let kick the ball through the gate (53) and the goal (52) with the same kick, and the time spent for performing a desired number of successful kicks - passing through goal (52) - on field section (36) is measured.

51. Procedure according to any of claims 42-50 **characterized in** that on field section (36) provided with a gate formed by electric passing-through sensors (53) and a goal (52) the time elapsed between the ball's passing through gate (53) and goal (52) is measured.

52. Procedure according to any of claims 42-51 **characterized in** that on field section provided with a gate (53) formed by a series of electric passing-through sensors (55) and a goal (52) , the velocity of the ball between gate (53) and goal (52) is also measured.

53. Procedure according to any of claims 42-49 **characterized in** that on field section (36) provided with at least one kick-off site (51) and with at least one goal (52) formed by a series of electric passing-through sensors (55), the passing of the ball through goal (52) is checked, and the velocity between the kicking off the ball and its passing through goal (52) is measured.

54. Procedure according to any of claims 42-46 **characterized in** that on field section (36) provided with kick-off site (51) and goal (52) the time elapsed between the passing of football player (17) through the starting point (36i) and the first kicking off the ball, and the last kicking off the ball and the passing of football player (17) through end point (36v) is measured.

54. Procedure according to any of claims 42-54 **characterized in** that on field section (31) provided with kick-off site (38) and target object (40, 41), football player is let kick the ball from kick-off site (38) at target object (40, 41) once with his right, and once with his left leg, and in both cases the time spent on field section (31) until a desired number of successful kicks - hit of target object (40, 41) - is measured.

55. Procedure according to any of claims 42-54 **characterized in** that on field section (32) provided with kick-off site (42) and reflective element (43) football player (17) should kick the ball from kick-off site (42) to one of reflective elements (43) once with is right, once with his left leg, take over the ball arriving back, kick it to the other reflective element (43), and in both cases, the time spent on field section (32) for a desired number of successful kicks - hitting the reflective elements (43)- is measured.

56. Procedure according to any of claims 42-55 **characterized in** that on field section (33) provided with reflective element (45) and goal (44), football player (17) is let to

- perform lobbing of the ball once with his right and once with his left instep to any of reflective elements (45), scoring the bouncing ball into goal (44) while running towards goal (44),

- once lobbing the ball with instep to any of reflective elements (45), then heading the bouncing ball into goal (44) while running towards goal (44),

kicking the bouncing ball to any of reflective elements (45), and scoring the ball arriving back to goal (44),

- time spent on field section (33) for a desired number of successful scorings with the right and left leg and headings passing through goal (44) is measured.

58. Procedure according to any of claims 42-57 **characterized in** that on field section (36) provided with gate (53) formed by a series of electric passing-through sensors (55) and goal (52), football player (17) should pass the ball through gate (53) and goal (52) with the same kick with his right and left leg as well, passing the ball through gate (53) and goal (52) is checked by electric passing-through sensors (55), and in both cases, time spent on field section (36) until reaching a desired number of successful kicks - passing both gate (53) and goal (52) - is measured.

59. Arrangement for improving the technical skills of football players comprising one or more field sections (61, 62, 63, 64, 65, 66) simulating different technical situations, on which in the given case, at least one of each of goals (68), and/or suspended obstacles (26), and/or wobbling obstacles (69), and/or reflective elements (70), and/or reflective elements adjustable in positions deviating from the vertical direction (73), and/or reflective elements adjustable in their height by a mechanism (74) are placed, **characterized in** that

- on one training ground (61), at least one goal (68), wobbling obstacles (69), reflective elements (70), above training ground (61), preferably on a straight line parallel to the straight line (68e) passing through goal (68), horizontal, straight holders (24) with suspended obstacles (26) are hanged with flexible tackles (25), and on each of both sides of goal (68), at least one reflective element (70) is placed,

- on one training ground (62), at least one goal (68), and above training ground (62), straight, horizontal holders (24) are placed preferably on a straight line parallel to straight line (68e) passing through goal (68), and on horizontal holders (24), suspended obstacles (26) are hanged with flexible tackles (25),

- on one training ground (63), at least one goal (68), wobbling obstacles (69) and above training ground (63), straight, horizontal holders (24) preferably parallel to the straight line (68e) passing through goal (68), on horizontal holders suspended obstacles (26) are hanged by flexible tackles (25),

- suspended obstacles (26) are on all training grounds (61, 62, 63) vertical bars,

- on one training ground (64), at least one goal (68) and reflective elements (73) adjustable with suitable mechanism into a position deviating from the vertical direction are placed,

- on one training ground (65), at least one goal (68) and one reflective element (74) adjustable by a suitable mechanism to different heights are placed, the reflecting plane (79) of which is carried by holding arms (80) on its both sides,

- on one training ground (66), at least one goal (68) is placed and its ground is covered by a grained material, and finally

- one training ground (67) is surrounded by a fence (76) forming a soft boundary.

60. Arrangement according to claim 59 **characterized in** that training grounds (61, 62, 63) provided with suspended obstacle (26) have at least two horizontal holders (24) above them.

61. Arrangement according to any of claims 59-60 **characterized in** that above any of training fields (61, 62, 63) provided with suspended obstacle

(26), the distance (T18) between the two external horizontal holders (24) lying in the direction of goal (68) is larger than the width (SK) of goal (68).

62. Arrangement according to any of claims 59-61 **characterized in** that on horizontal holders (24) above any of training grounds (61, 62, 63) provided with suspended obstacle (26), at least four suspended obstacles (26) are hanged.

63. Arrangement according to any of claims 59-62 **characterized in** that on any of training grounds (61, 63) containing wobbling obstacle (69), at least four wobbling obstacles (69) are placed.

64. Arrangement according to any of claims 59-63 **characterized in** that on training ground (61) provided with goal (68), wobbling obstacle (69), reflective element (70) and suspended obstacle (26) at least two reflective elements (70) are placed.

65. Arrangement according to any of claims 59-64 **characterized in** that on training ground (61) provided with goal (68), wobbling obstacle (69), reflective elements (70) and suspended obstacles (26), the axes (70t) of reflective elements (70) intersect the axis (68t) of goal (68), and these intersections (M1) are on the internal side of training ground (61) relative to goal (68).

66. Arrangement according to any of claims 598-65 **characterized in** that on training ground (61) provided with wobbling obstacles (69), reflective elements (70) and suspended obstacles (26), reflective elements (70) are provided also with a mechanism capable of adjusting them into positions different from vertical position.

67. Arrangement according to any of claims 59-66 **characterized in** that on training ground (64) provided with at least one goal (68) and at least two re-

flective elements (73) adjustable to directions deviating from the vertical position.

68. Arrangement according to any of claims 59-67 **characterized in** that on training field (64) provided with at least one goal (68) and reflective elements adjustable to directions deviating from the vertical position (73) the axes (73t) of reflective elements (73) intersect the axis (68t) of goal (68), and intersections (M2) fall to the internal side of training ground (64) relative to goal (68).

69. Arrangement according to any of claims 59-68 **characterized in** that for covering training ground (66), the grained material (75) applied is sand.

70. Arrangement according to any of claims 59-69 **characterized in** that except for training ground (67) surrounded by fence (76) forming a soft boundary, fences (71) of the other training grounds (61, 62, 63, 64, 65, 66) are hanged to their holders with flexible elements.

71. Arrangement according to any of claims 59-70 **characterized in** that except for training ground (67) surrounded by fence (76) forming a soft boundary, on other training grounds (61, 62, 63, 64, 65, 66), on the bottom of fence (71) or in front of it, reflective elements (72) are placed.

72. Arrangement according to any of claims 59-69 **characterized in** that on training ground (67) surrounded by a fence (76) made of soft material, this fence (76) is a flexible (soft) net hanged on holders (77) placed outside the plane of fence or above it with flexible elements.

73. Arrangement according to any of claims 59-69 or 72 **characterized in** that the fence (76) of training ground (67) surrounded by a soft boundary is a

flexible net the actual height of which is larger than the distance between its upper end and the ground when hanged.

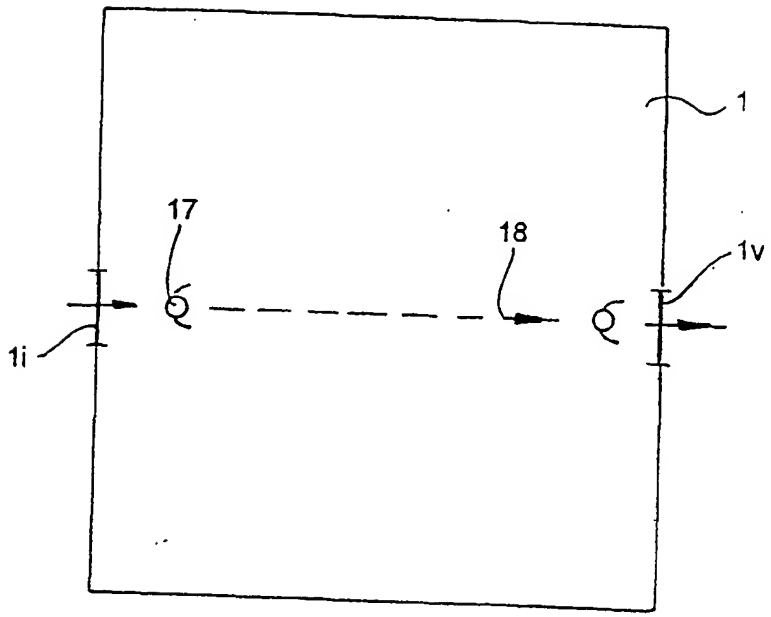
74. Arrangement according to any of claims 59-69 or 72-73 **characterized in** that the fence (76) of training ground (67) surrounded by a soft boundary is a flexible net the actual height of which is smaller than the distance between its upper edge and ground when hanged, and only its upper edge is fixed.

75. Suspended obstacle for testing the physical condition of human body and/or technical skills of football players and/or for improving the technical skills of football players **characterized in** that suspended obstacle (26) is a vertical bar the upper end of which is hanged in a known manner onto a horizontal holder (24) with flexible tackles (25) capable of unhindered deviation in every direction.

76. Suspended obstacle according to claim 75 **characterized in** that flexible tackles (25) are placed onto horizontal holders (24) crossing each other.

77. Suspended obstacle according to claims 75 or 76 **characterized in** that horizontal holders (24) carrying flexible tackles (25) are nets.

78. Reflective element for improving the technical skill of football players with any reflecting plane of adjustable height **characterized in** that it has on both sides holding arms (80) in the vertical plane, onto which reflecting plane (79) is fixed at its two vertical side with known fixing elements (84) which can be fixed at any position and are releasable.



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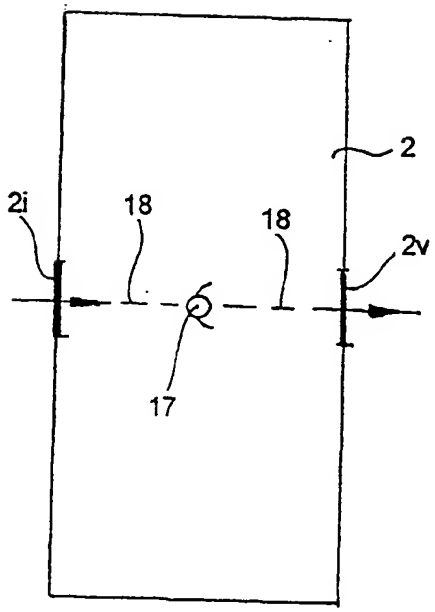

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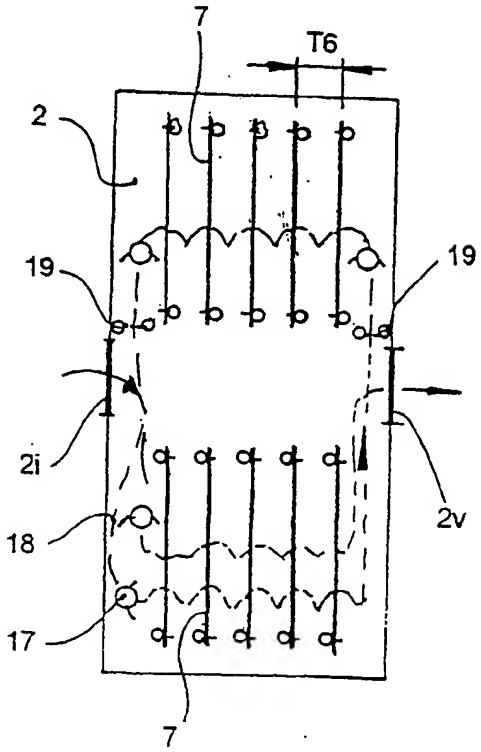

Fig. 3.

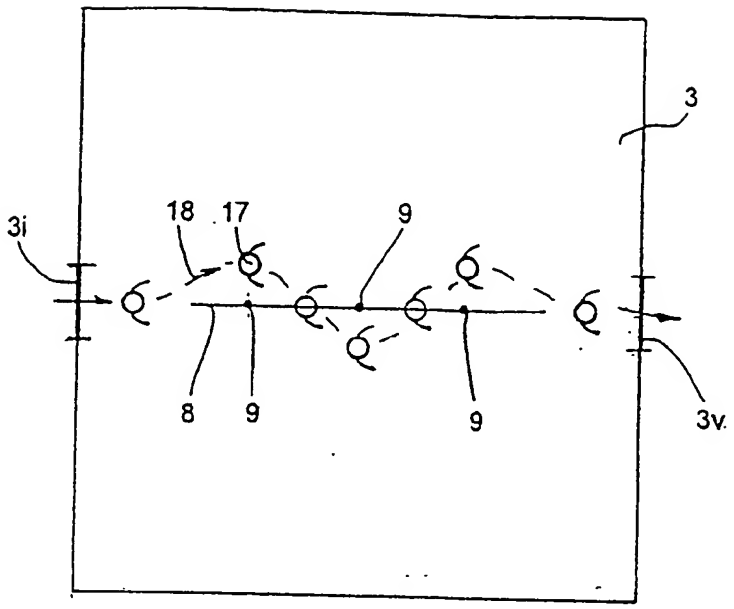

Fig. 4.

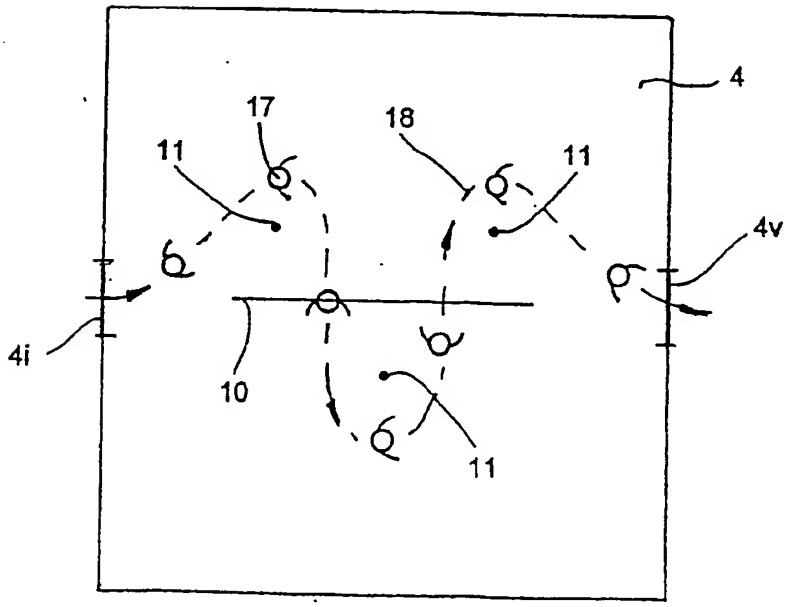

Fig. 5.

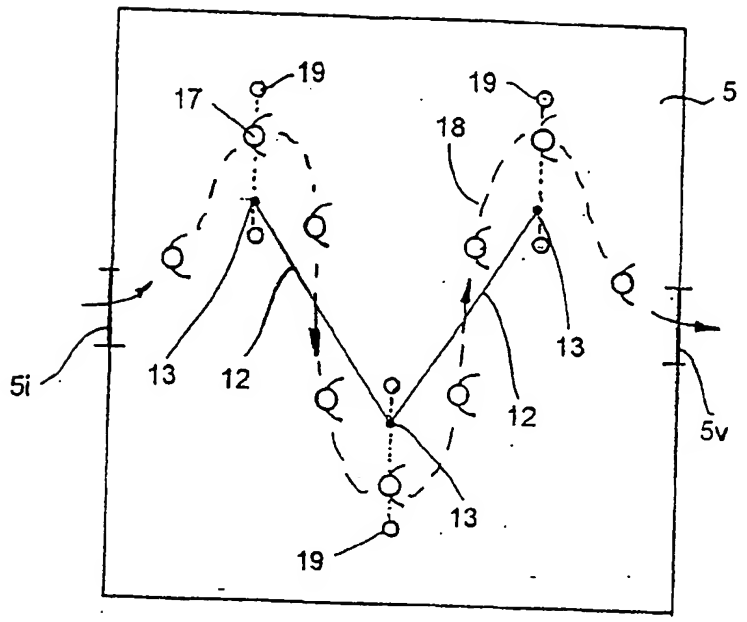
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Fig. 6.

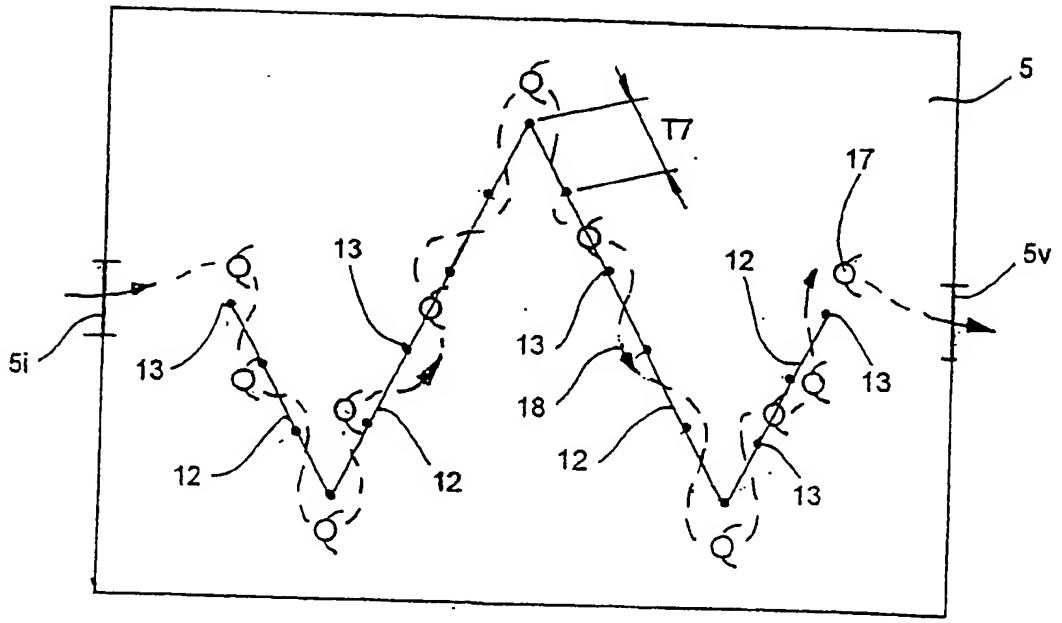
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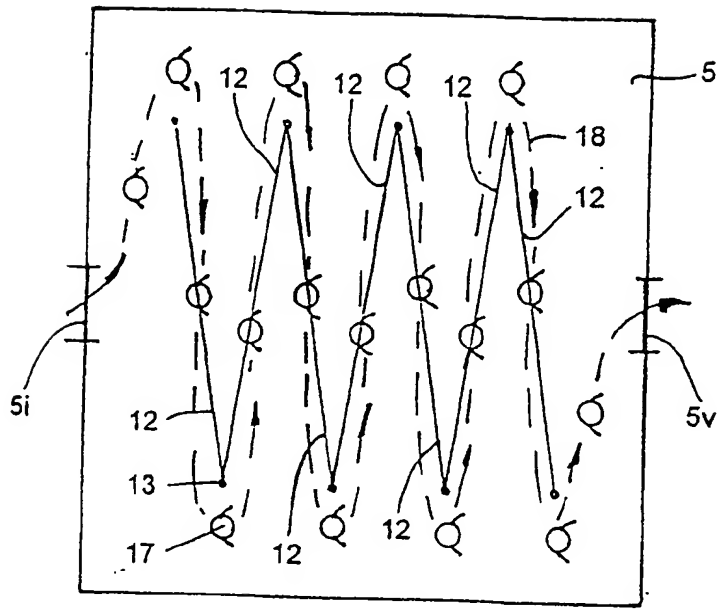
Fig. 7.



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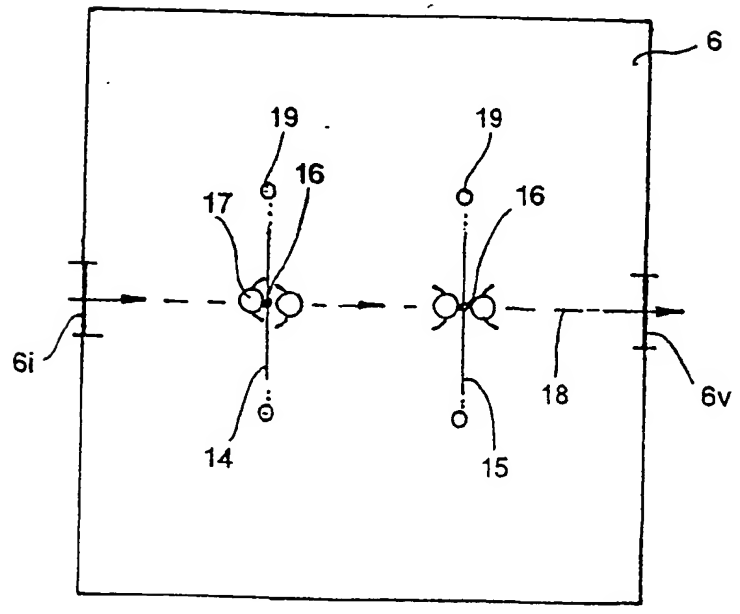

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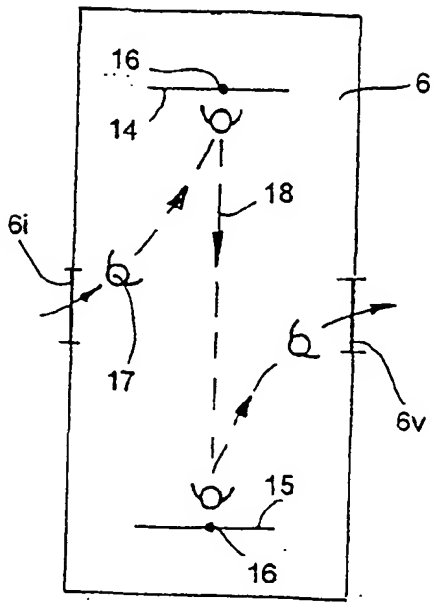

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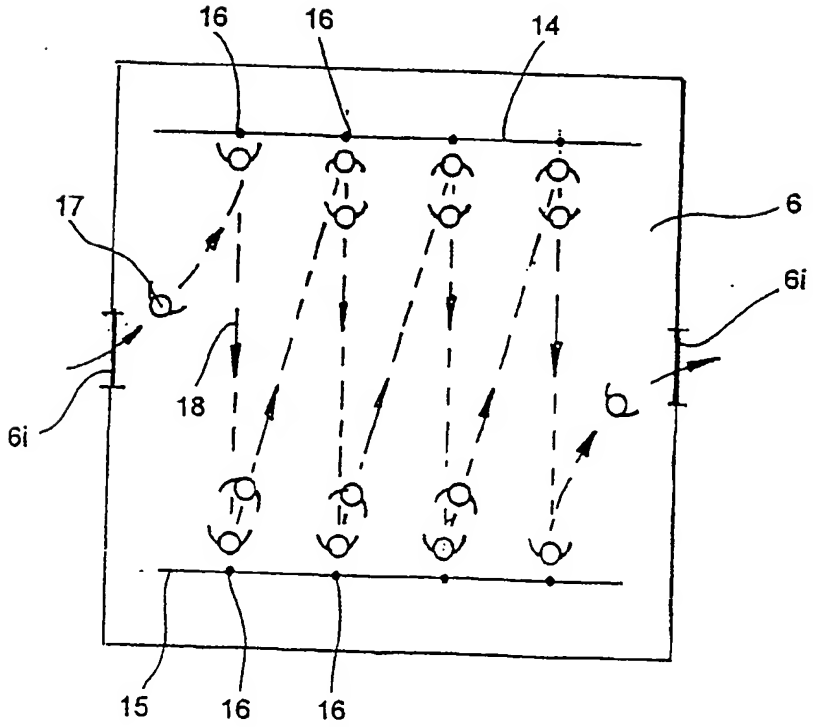

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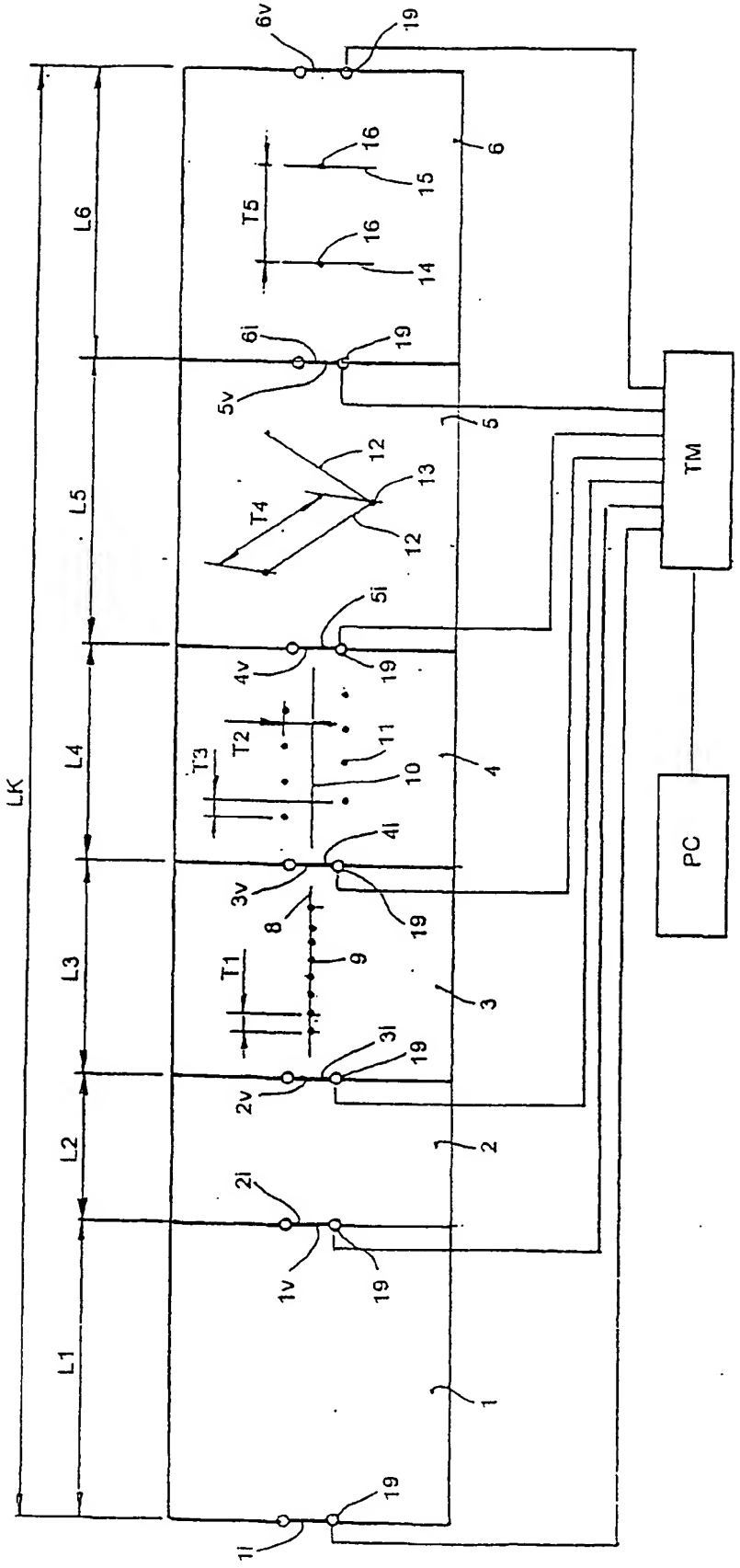

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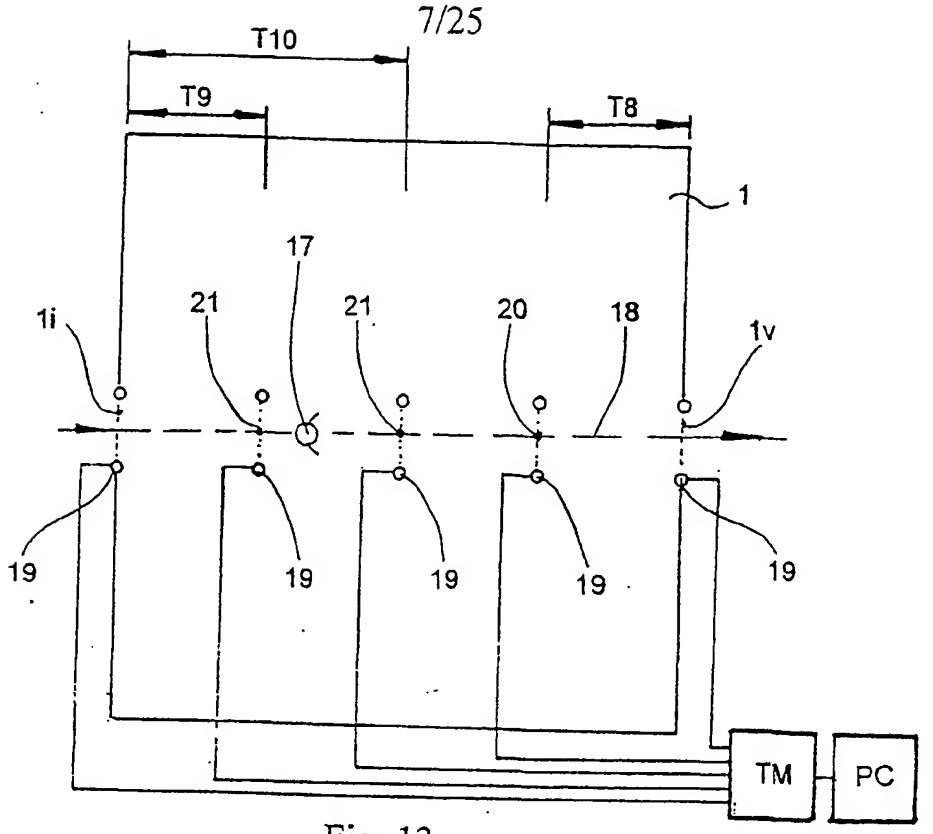
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Fig. 13.

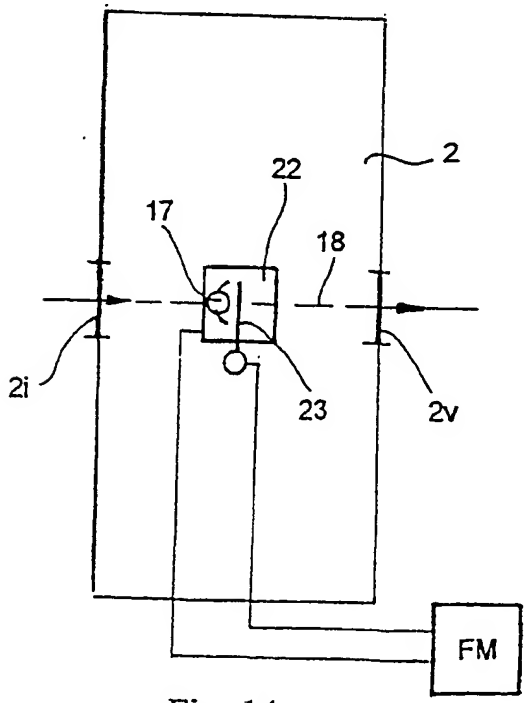
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Fig. 14.

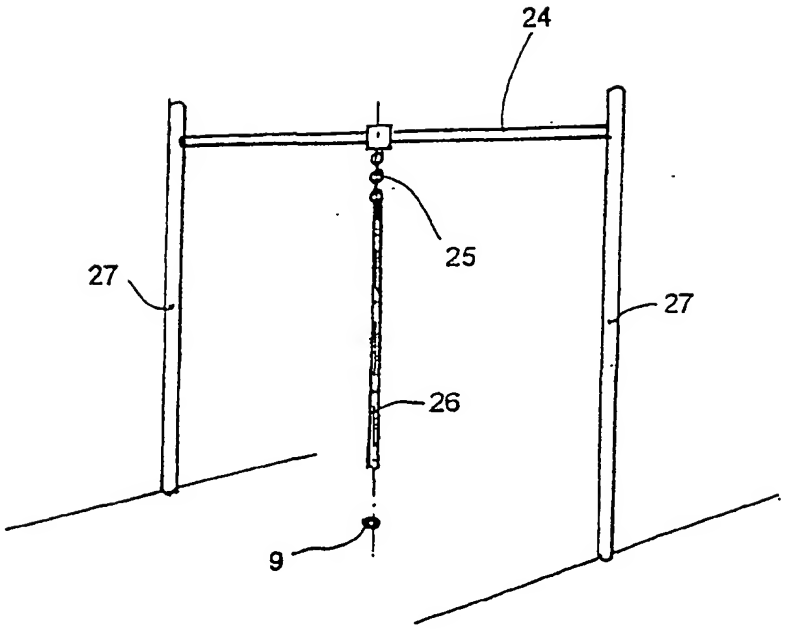
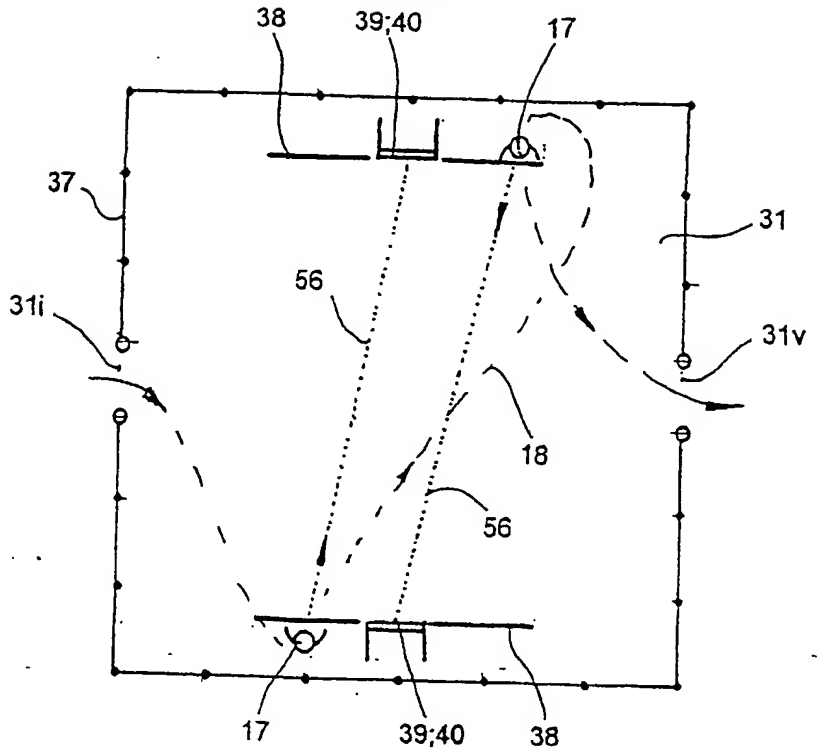


Fig. 15.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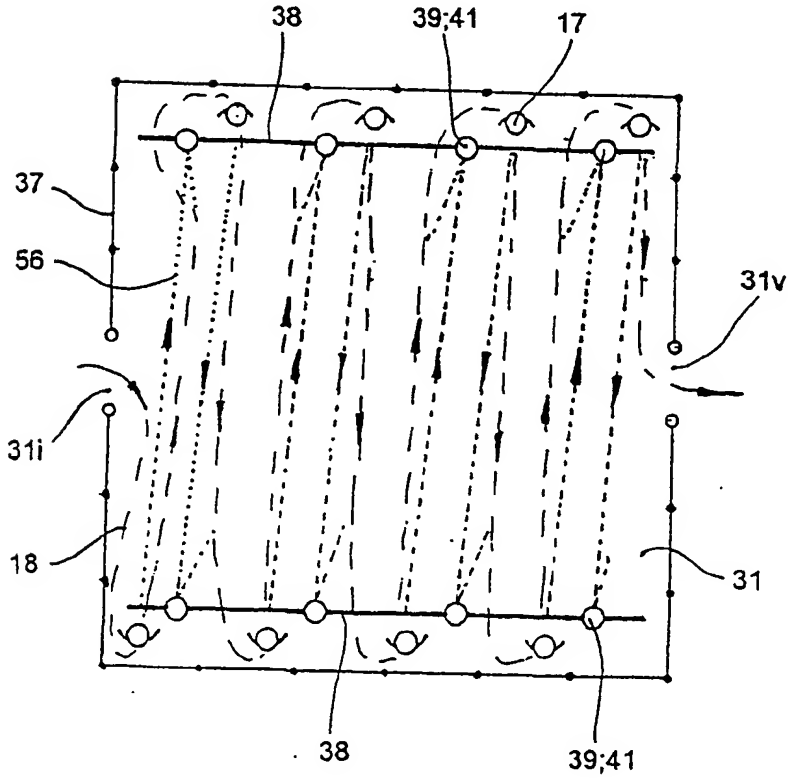
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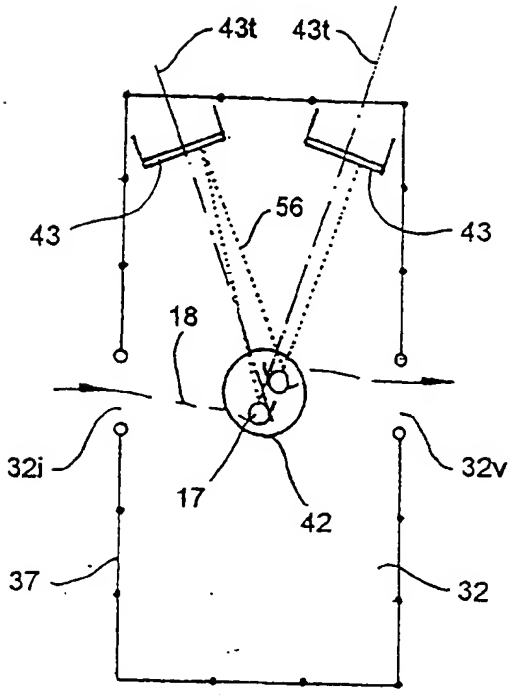
Fig. 17.



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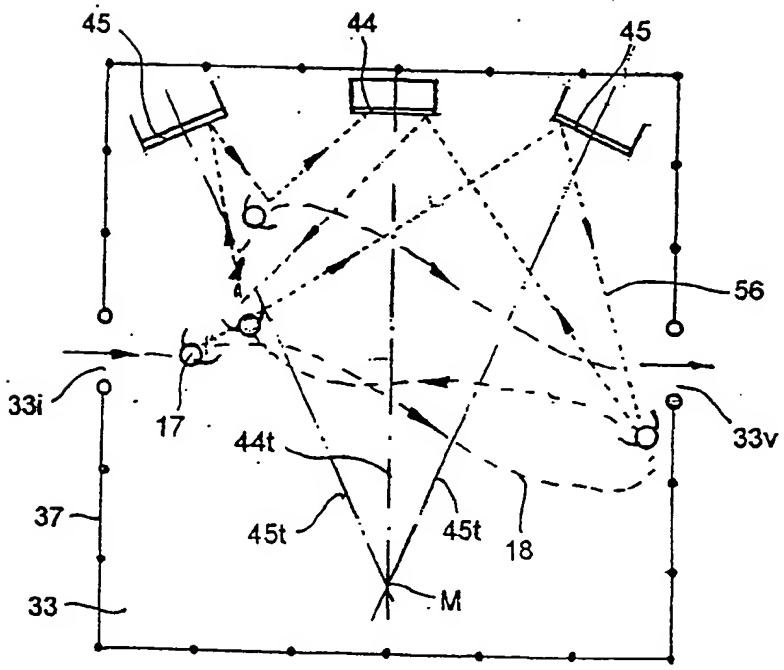

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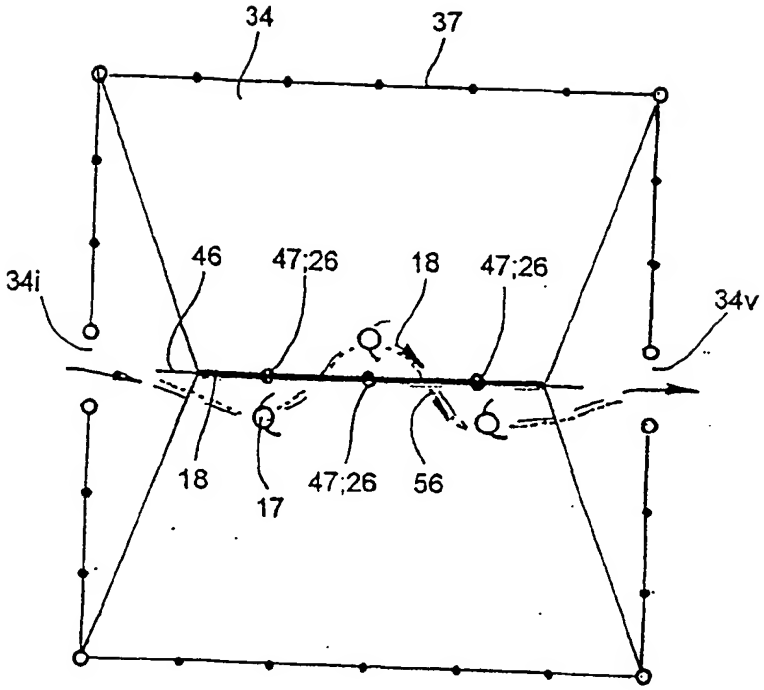
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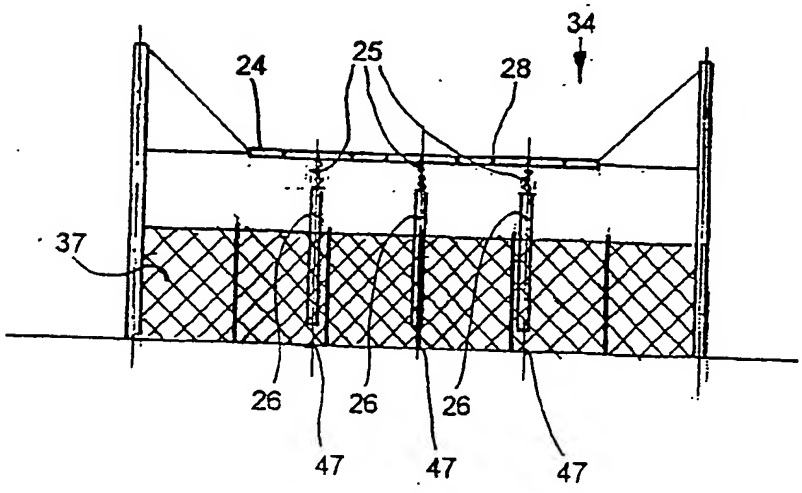
Fig. 20.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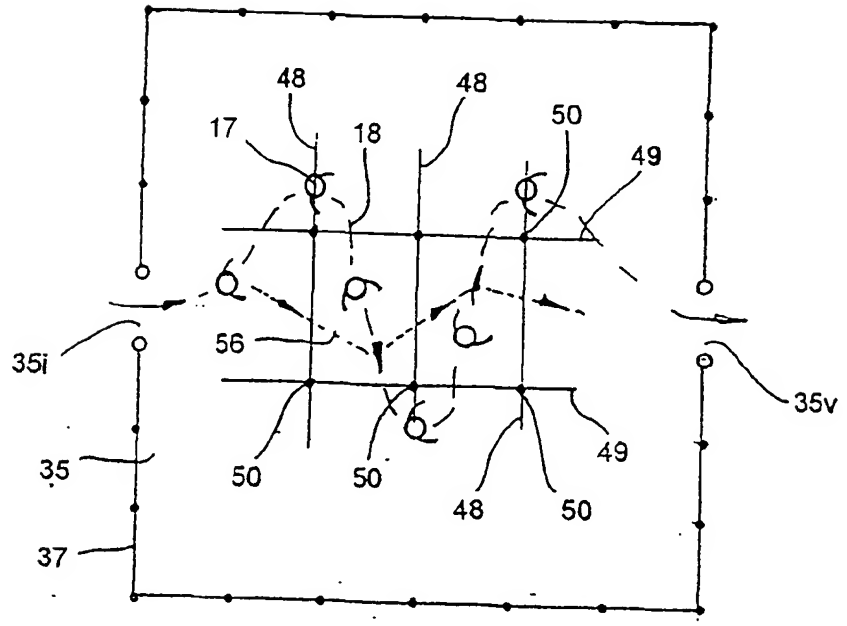

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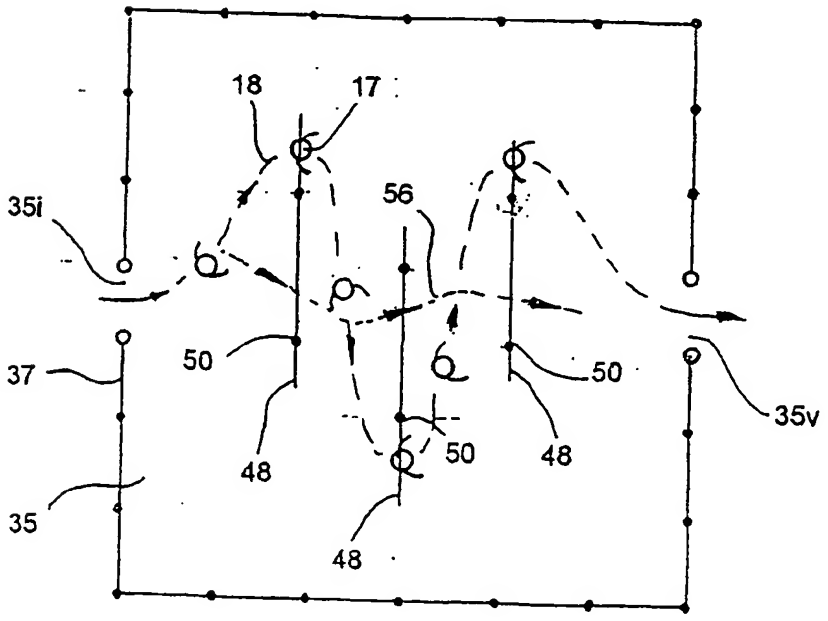

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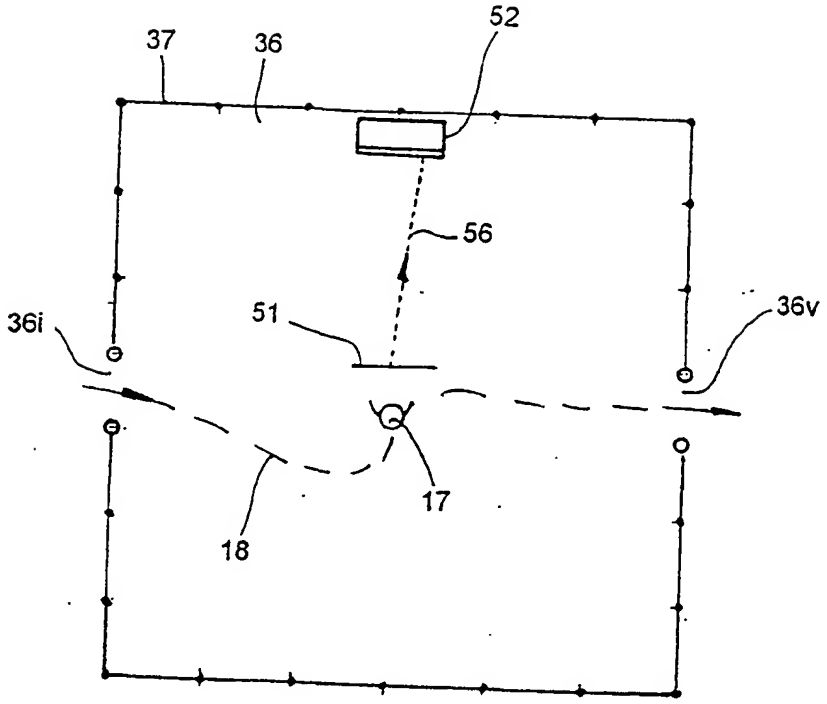

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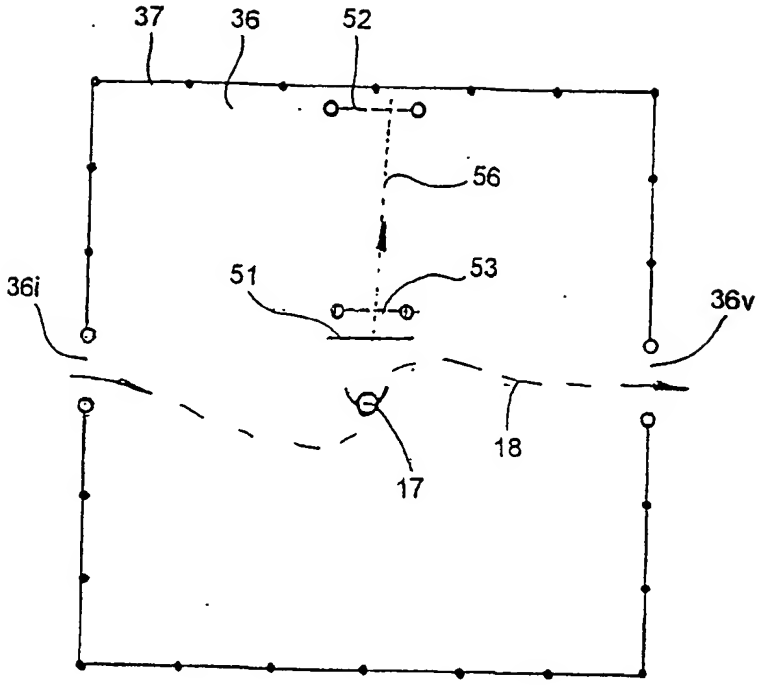

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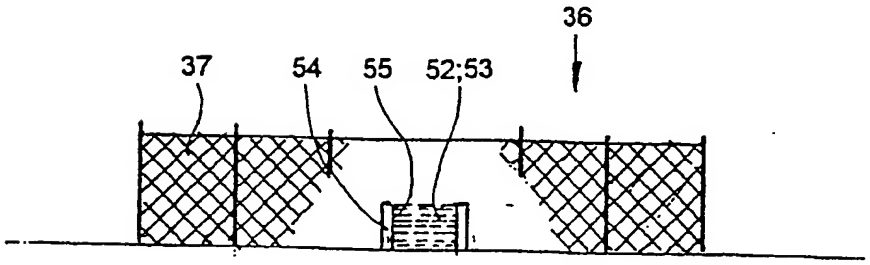

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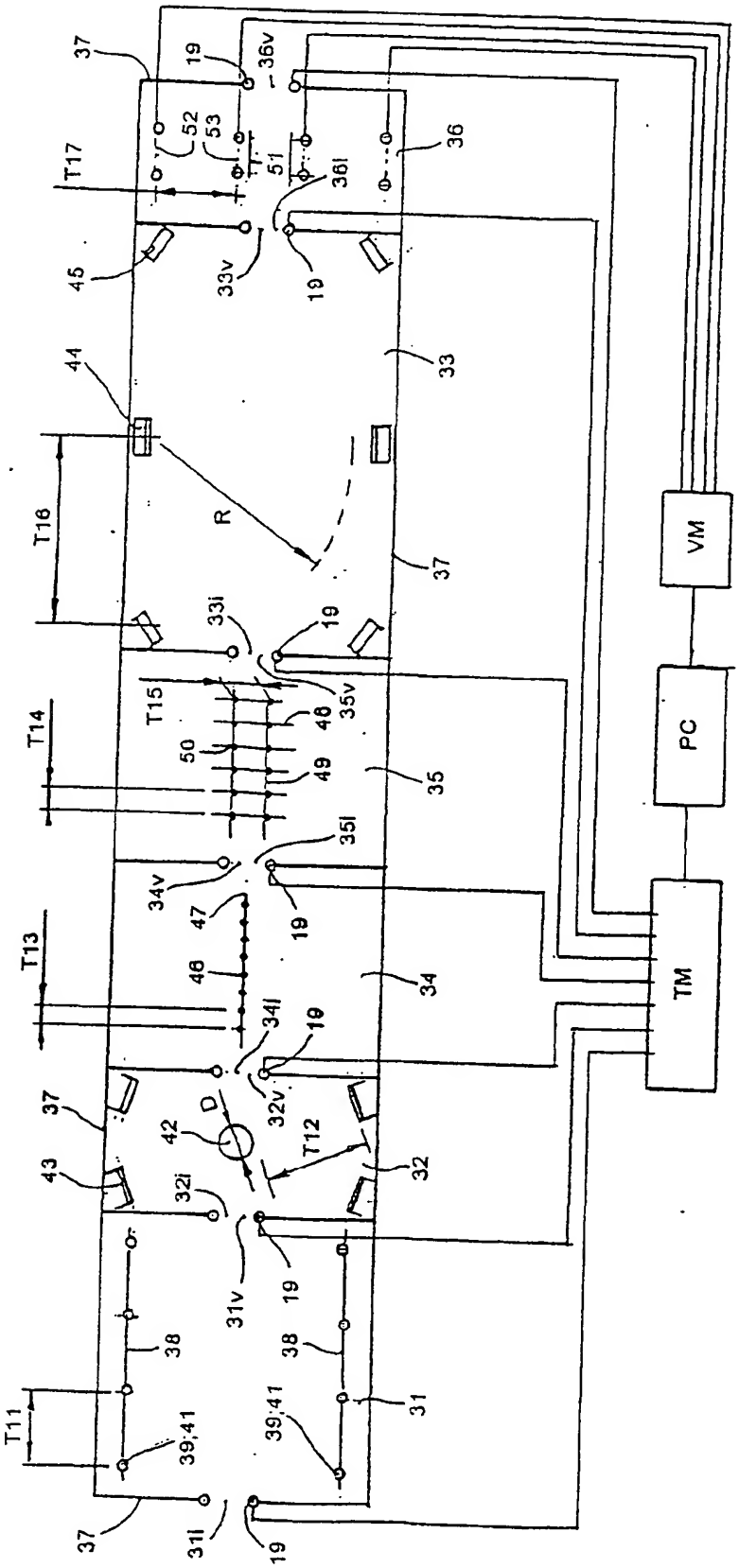
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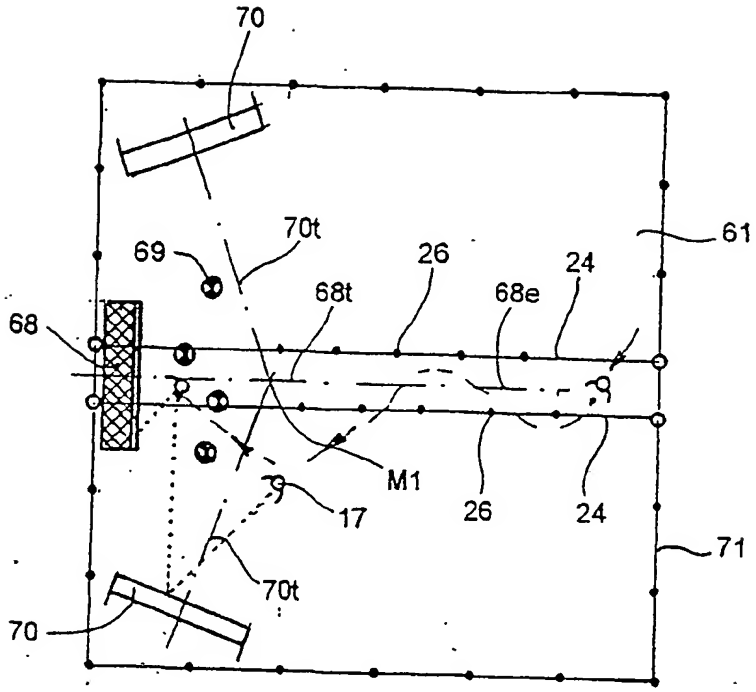
Fig. 27.



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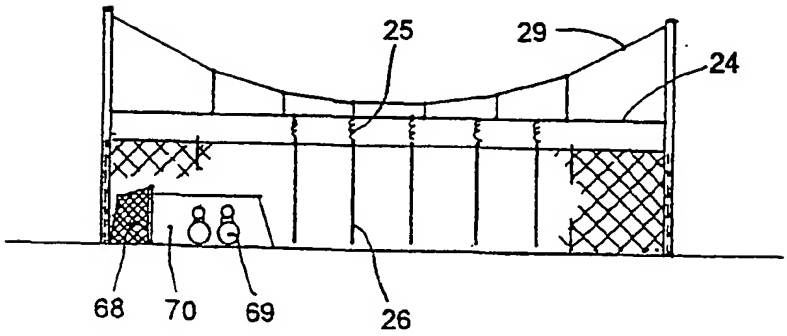

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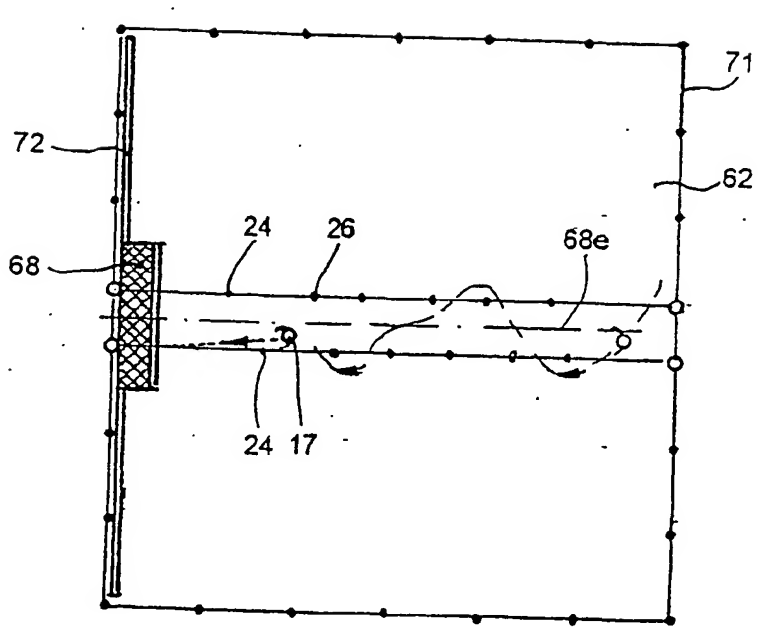

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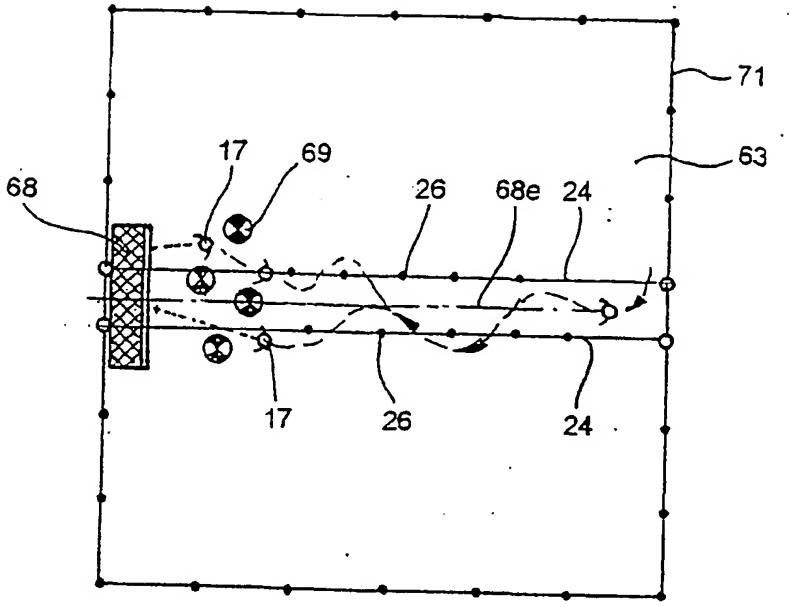

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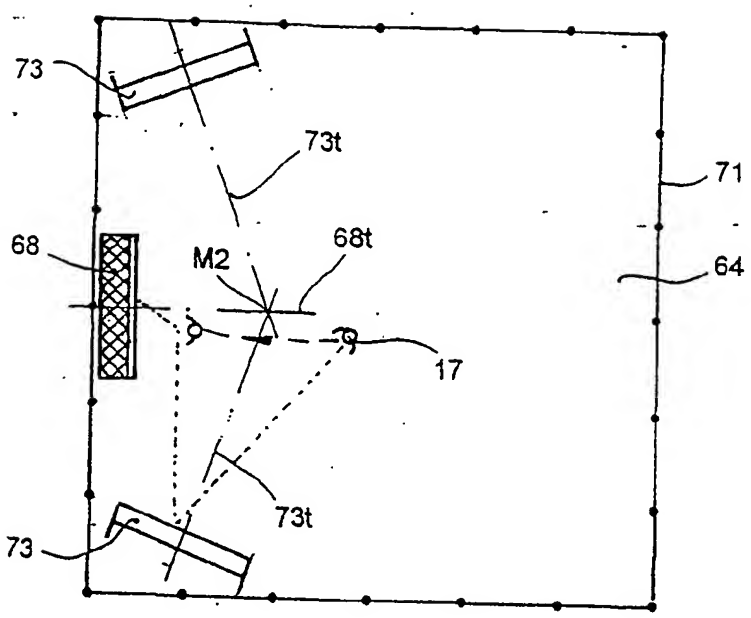

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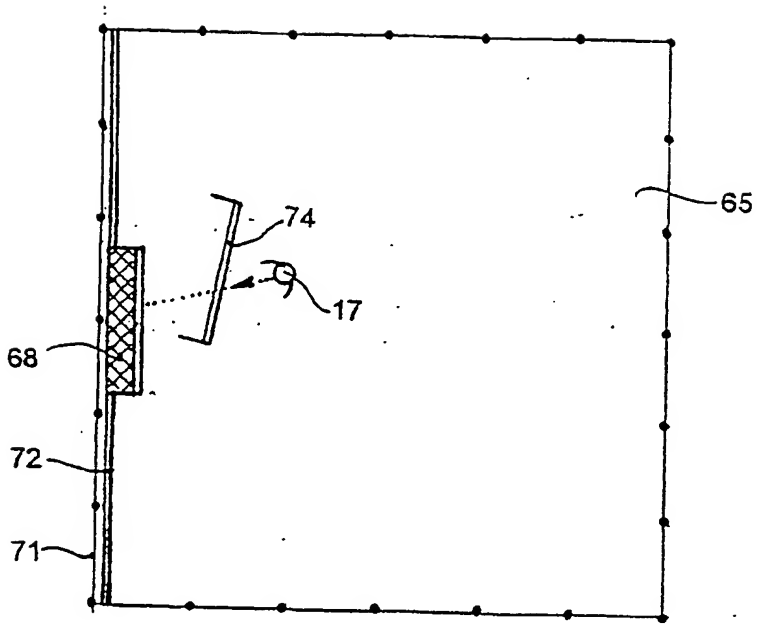
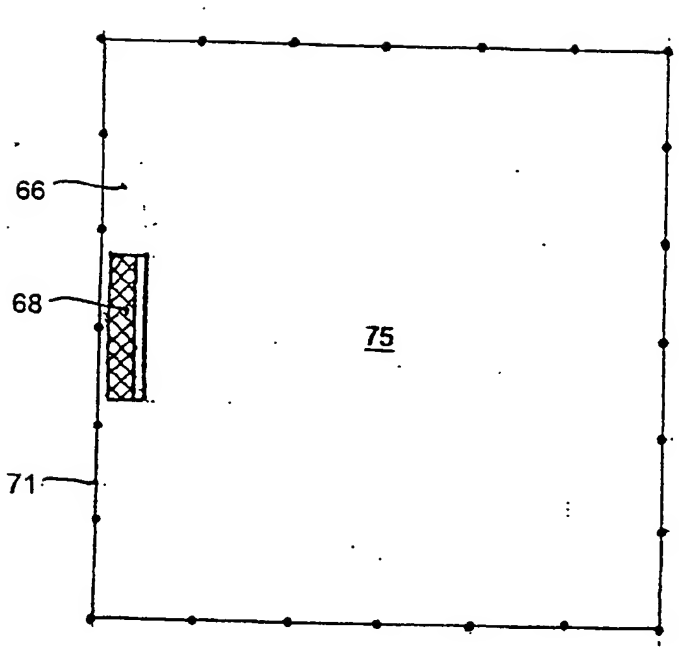


Fig. 33.



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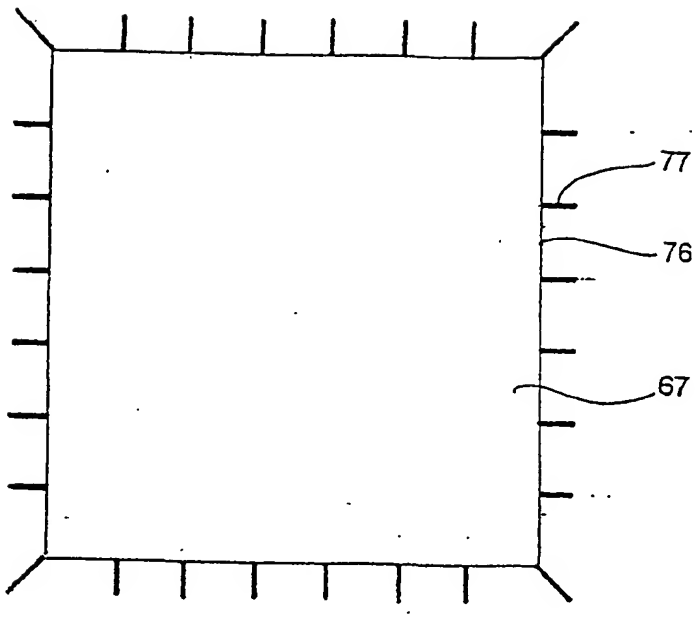

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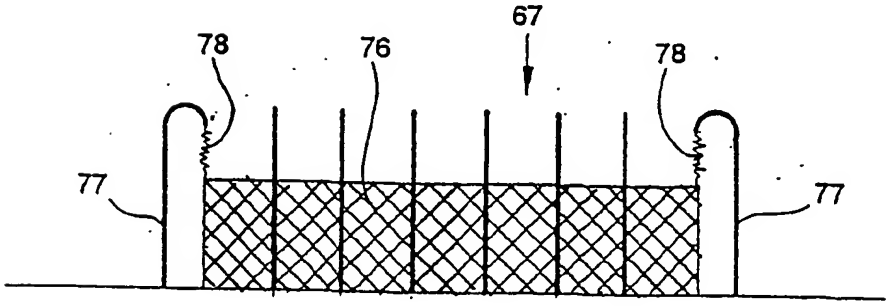

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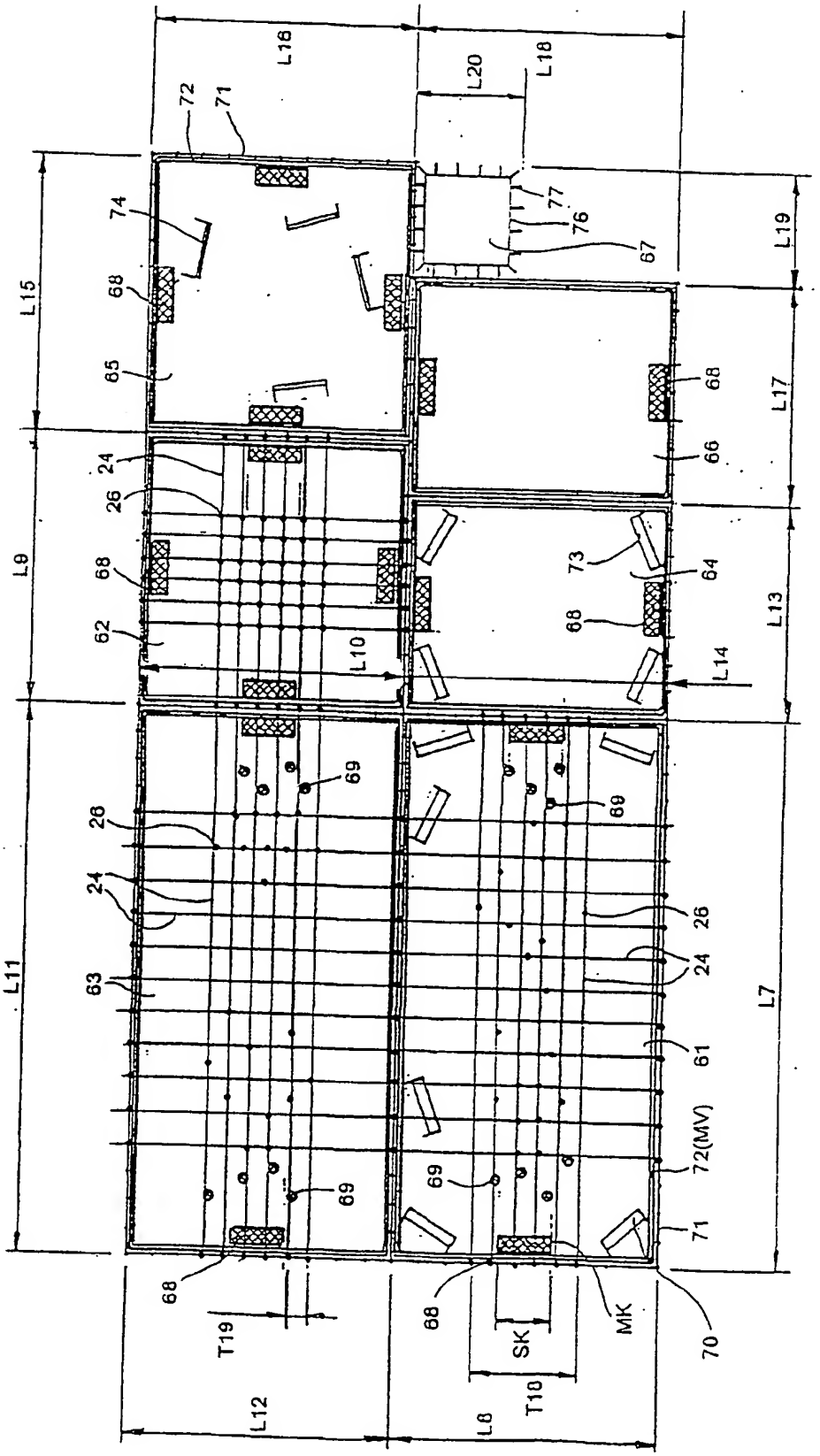
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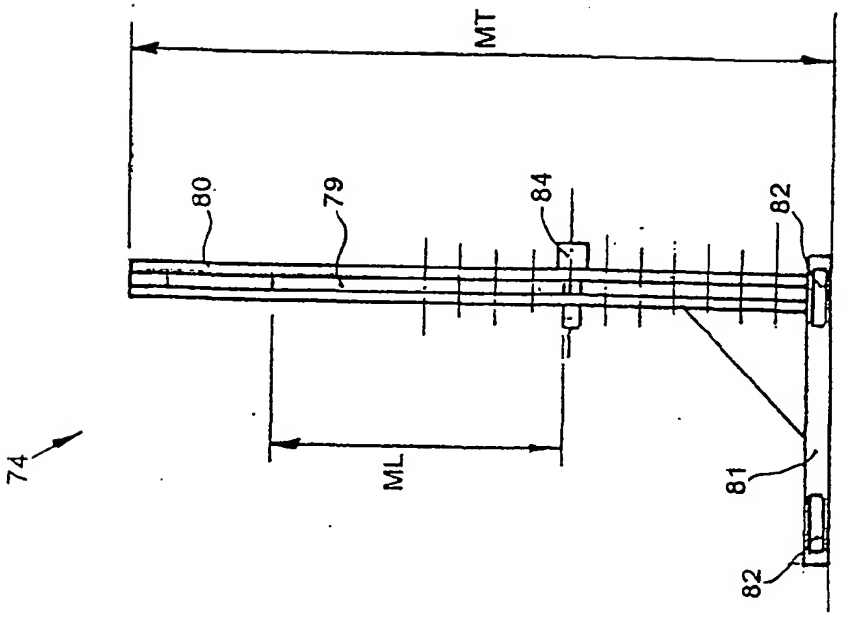
Fig. 37.



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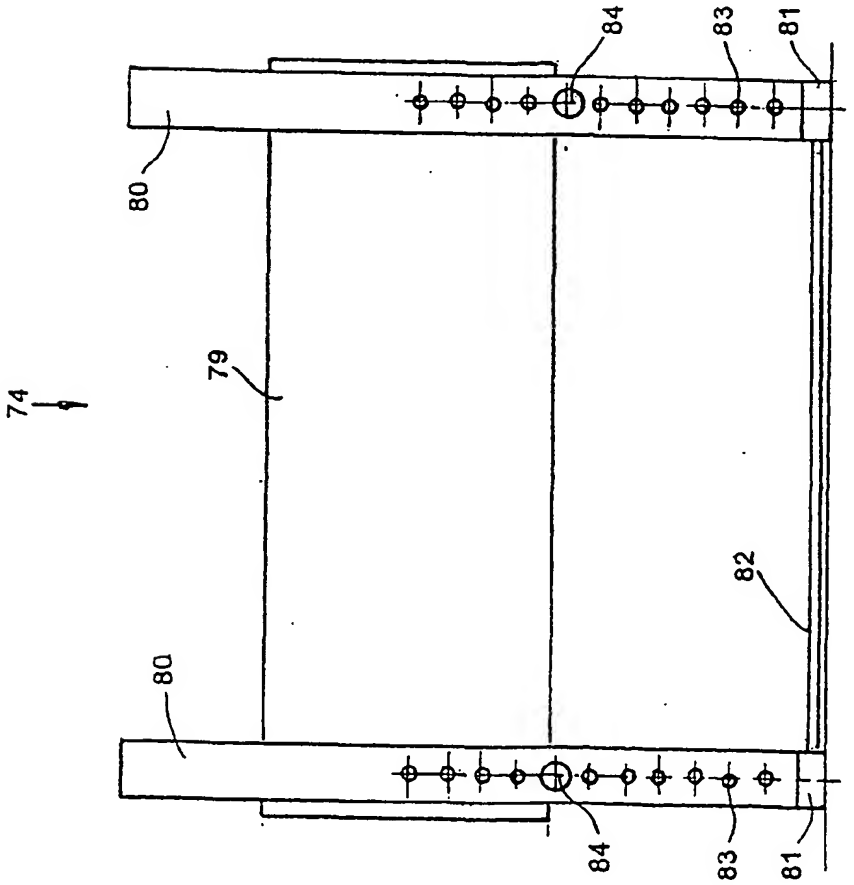

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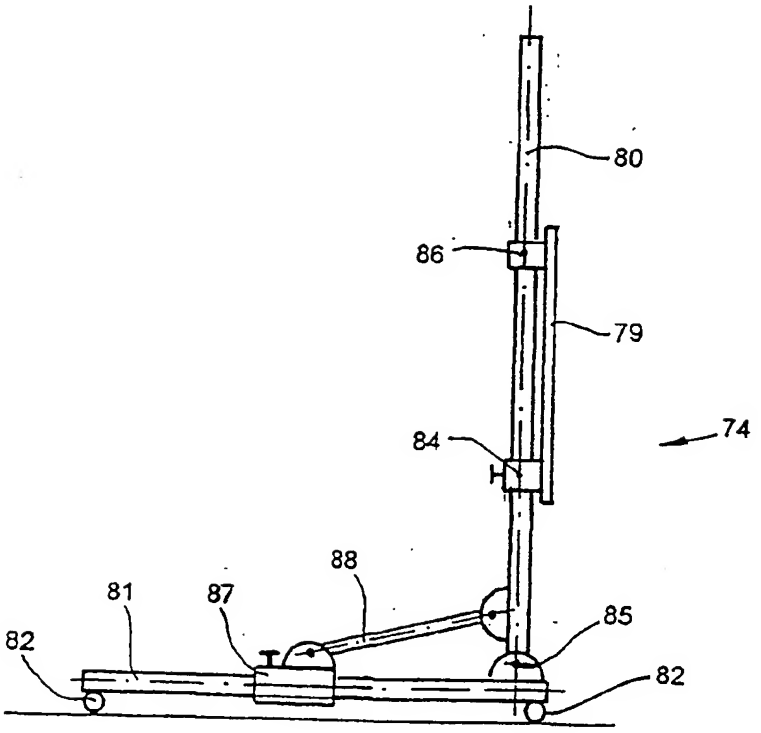

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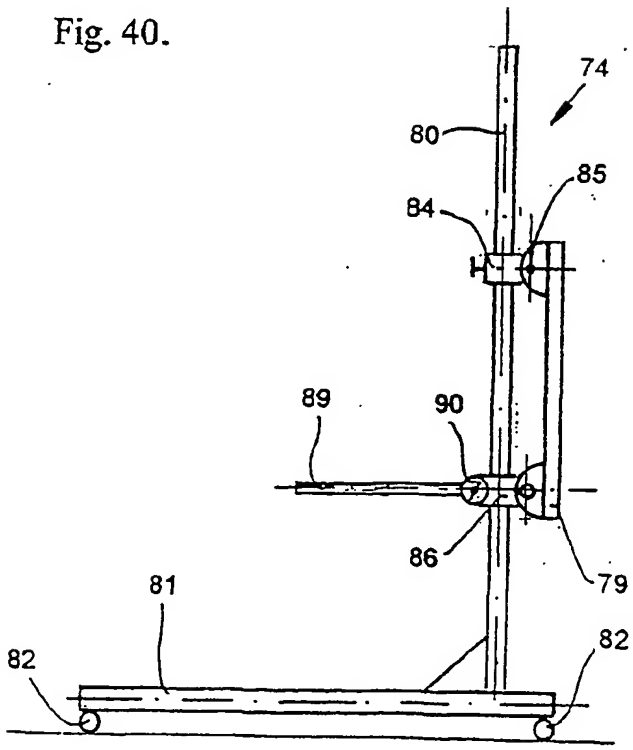

Fig. 41.

INTERNATIONAL SEARCH REPORT

Interna Application No
PCT/nu 00/00025

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A63B69/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4 645 458 A (WILLIAMS JERRY R) 24 February 1987 (1987-02-24) cited in the application see the whole document ---	1-16, 18-30 17,31-74
Y	US 4 491 315 A (DYE) 1 January 1985 (1985-01-01) abstract; figures 1-3 ---	31-74
Y	US 5 913 242 A (STUESSI) 15 June 1999 (1999-06-15) abstract; figures 1,2 ---	17
A	US 5 732 954 A (STRICKLER ET AL.) 31 March 1998 (1998-03-31) abstract; figures 1,2 --- -/--	1-74

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 November 2000	09/11/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Michels, N

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Interna[illegible] Application No
PCT/HU 00/00025

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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